

Approaching the Dizzy Patient (An Overview)

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Abstract

Dizziness is known to be one of the most burdensome medical complaints, which is frequently encountered by physicians all over the globe. Despite many advances in laboratory and radiologic investigations, in addition to the advents in vestibular testing technologies, deep knowledge of the basic concepts remains the cornerstone in understanding balance.

We, therefore, aimed to impart a systematic way for approaching the dizzy patient, and provide the reader with review of the paramount steps for dealing with dizziness cases, through overviewing the basic concepts, understanding the definition of different dizziness sensations, detailed history taking and physical examination, investigations and performing classical maneuvers for balance and vestibular system targeted by history and physical examination.

Using the above mentioned approach will allow the physician to diagnose and manage most of the common pathologies, without performing unneeded laboratory tests, radiologic imaging or vestibular tests.

Keywords: Dizziness, Dizzy, Vertigo, Nystagmus, Vestibular.

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1- Introduction

Dizziness is a symptom that falls into the preview of many different medical specialties, and considered a multifactorial problem⁽¹⁻⁶⁾, and associated with cardiovascular, psychiatric, sensorineural diseases and the use of several medications in the elderly patients^(3, 5, 7, 8, 9)

Dizziness accounts for 3.5% of emergency department admissions⁽¹⁰⁾. It is also not uncommon in pediatric age group. The prevalence in school age is estimated to be

15%⁽¹¹⁾. Seventy percent of dizziness was diagnosed of having organic cause from the initial visit and comes to be the third symptom (5.5%) among the 14 common symptoms in 1000 internal medicine outpatient's clinic⁽¹²⁾.

Etiology of dizziness was described in patients referred to specialized clinics^(1, 6, 13) or in primary care settings^(2, 3, 14) and in tertiary referral settings^(4, 6). The results of these studies showed a large variation which is believed to be due to different populations and different approaches to the target patients

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(5, 6).

Dizziness is a common and non-specific symptom. It is often distressing complaint to patients and frustrating to treating physicians because it is a term which covers a wide range of sensations, difficult to define with a great variety of diagnostic findings and is troublesome to treat.

The aim of this article is to provide a systematic method of approaching the dizzy patient. The basic concepts, definition of sensations, detailed history-taking, pertinent physical examination, appropriate investigation and traditional procedures and maneuvers for balance and nystagmus will be emphasized. Also, the most common disorders that present with dizziness should allow the treating physician to be more selective, rather than being routinely screening, in this diagnostic process and without unnecessary redundancy in investigative scheme. Most of these investigative and laboratory tests should be performed if needed and in relevant cases, and should be confined to targeted potential causes identified in the history and physical examination.

2- Basic Concepts

Balance and equilibrium of the body is maintained by a complex function which requires interaction among proprioceptive, visual, and vestibular systems. The sensory inputs from these three sensors pass to the central nervous system (brainstem, cerebellum, cortex, and different connections) where recognition, integration, and processing take place. Any mismatch among the sensory inputs from these systems will result in imbalance, dizziness, and may be associated with one or more of other symptoms and signs like falling, nystagmus, nausea, vomiting, sweating and

pallor.

Proprioceptive function: the sensory inputs come from muscles, tendons, joints, and skin (pressure sensation and footpads). These inputs are conducted along the posterior column of the spinal cord to the brainstem and cerebellum contributing information about the position of the body in relation to the environment.

Visual Function: this system provides information about the relationship of the body and its parts to the environment and about what is up and what is down. All visual information gives useful clues to the orientation.

Vestibular function: this system serves three major functions: 1- detection of head movement and position in the space, 2- vestibulo-ocular reflexes (counter-roll the eyes against the direction of head movement and maintain the eyes on the visual target), and 3- control of the tone in the antigravity muscles.

The vestibular function can be detrimentally affected by many inner ear pathologies, and even middle ear pathologies like chronic otitis media. da Costa Monsanto and Erdil M et. Al studied microscopically the temporal bones of patients with chronic otitis media and compared them with a control group. Significant decrease in the number of vestibular sensory cells and dark cells was found, which could be the cause of the dizziness in chronic otitis media patients⁽¹⁵⁾.

Central nervous system: the place where the sensory input information is recognized, integrated, and processed. The response is executed to the muscles to maintain the body posture and eye position. The cerebellum coordinates the response and turns it smooth. Knowledge of the anatomy and the physiology

of these systems, especially the vestibular system, are essential but this is beyond the scope of this article.

3- Definitions

Most of the dizziness sensations fall into one of the following five categories or subtypes:

Vertigo: vertigo is defined as a sensation of rotation or spinning of either oneself or the environment (surroundings). It can occur spontaneously or on change of position or posture. This diagnosis narrows the differential diagnosis between peripheral and central vestibular disorders or causes. It is the most common subtype of dizziness^(1, 2, 6, 13, 16) and most causes are due to peripheral vestibular system (vestibular nerve or labyrinth) lesions^(1, 2, 4, 6). Autonomic (vegetative) manifestations such as nausea, vomiting, sweating, and pallor are commonly associated with vestibular disorders.

Unsteadiness: unsteadiness or disequilibrium imply a sensation of imbalance when standing or walking and the patient will perhaps have to support himself against a steady object. This postural instability is generally involving the lower limbs and trunk without cephalic sensation. This diagnosis does not help narrow the differential diagnosis, as does vertigo, because of its multiple etiologies⁽¹⁻⁶⁾. The feeling of unsteadiness is usually caused by a wide range of non- vestibular disorders including **cardiovascular disorders** such as hypertension, postural hypotension, and cardiac arrhythmias; **metabolic disorders** such as diabetes, hyperlipidemia, hypoglycemia, and thyroid diseases; **musculoskeletal (locomotor) disorders** such as arthritis, myopathy, peripheral

neuromuscular ataxia, peripheral neuropathy, Paget's disease, and spinal degeneration; **ocular disorders** such as errors of refraction, glaucoma, and ocular muscles disease; and **cervical osteoarthritis**.

Lightheadedness: lightheadedness or presyncope (impending faint) is a sensation of an impending faint or floating or blurring of vision. This symptom complex is episodic and usually triggered by a variety of causes including temporary cerebral ischemia, vertebrobasilar insufficiency, vasovagal attacks, postural hypotension or exercise, and anxiety or hyperventilation.

Oscillopsia: oscillopsia is a subjective visual sensation of oscillating objects up and down with head movement on walking or rapid head movement⁽⁶⁾, or tilting of the environment with head movement which is caused by loss of bilateral otolithic function^(17, 18). The symptom is due to poor stabilization of the visual image on the retina during head movement. Oscillopsia occurs as a result of bilateral vestibulopathy with vestibule-ocular reflex failure, and gait and posture instability which increases in darkness^(19, 20). Also, lesions in the oculomotor and cerebellar systems may cause oscillopsia⁽²¹⁾.

Other sensations or psychogenic dizziness: when the description of sensation is not clear and vague, or the patient feels removed from himself (depersonalization), or the patient feels as if the surroundings are unreal (derealization) like seeing objects on a movie screen, or the patient may have difficulty describing his sensation. Such sensations are most often caused by psychological disturbances, and are most frequently a manifestation of severe anxiety, depression, stress, and somatization disorder. Some patients have episodes of

hyperventilation during the course of panic attacks precipitated by different agoraphobic conditions.

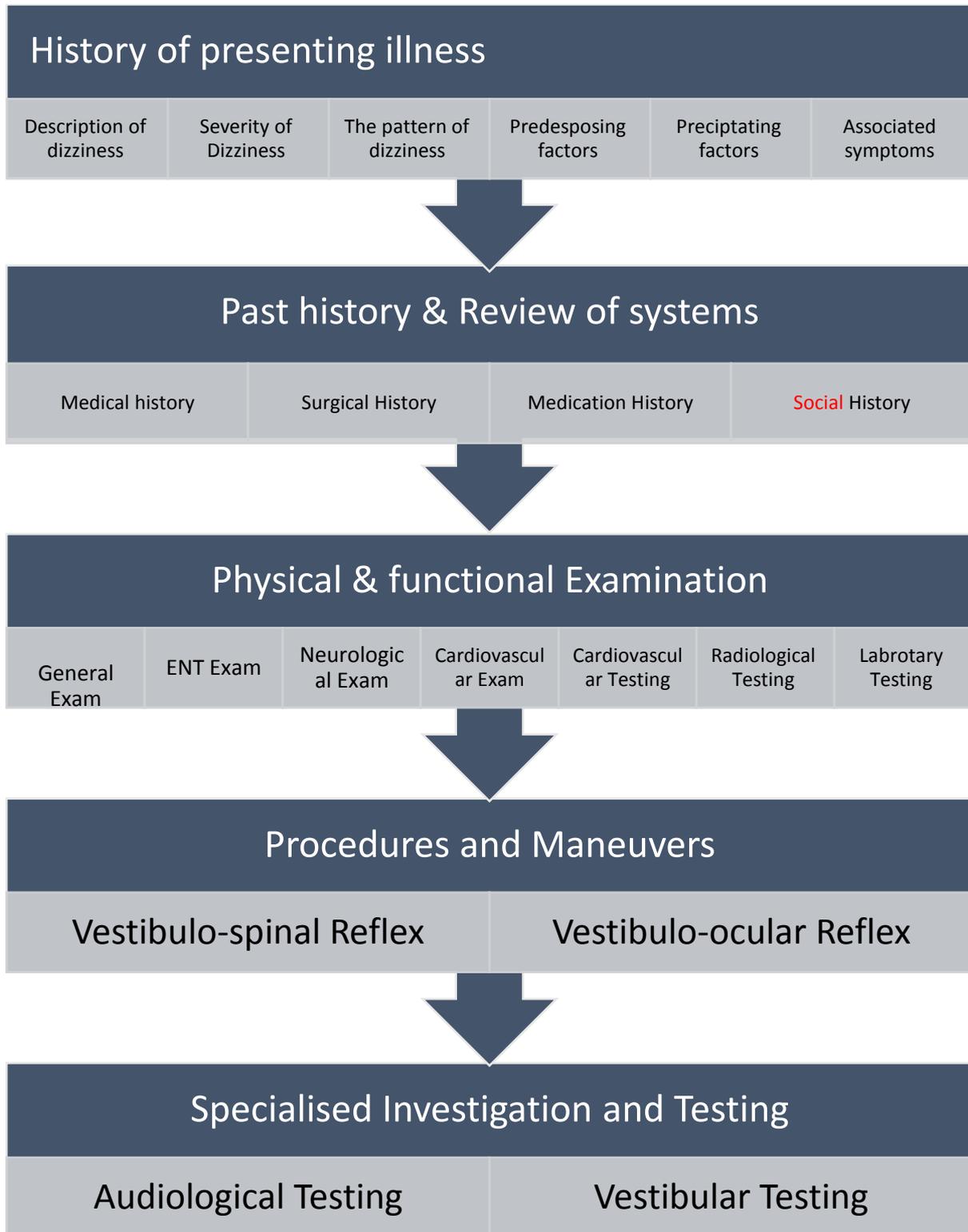


Figure 1: Systemized algorithm for approaching the dizzy patient

4- History of Presenting Illness

A detailed medical history is considered the most important diagnostic tool in evaluating the dizzy patient, because in many diseases the results of physical examination, the laboratory tests, and the radiography are normal and a thorough medical history is considered the

cornerstone in diagnosis. Sloance and Baloh (1989) and Kroenke et al (1992) found that 69% and 76% (respectively) of diagnoses were based on the history alone. In history-taking, the clinician should elicit the following information, which are summarized in table 1:

Table 1: A comparison between peripheral and central vertigo using history and exam

Symptom/Sign	Peripheral	Central
Onset	Sudden	Insidious
Pattern	Episodic, paroxysmal	Continuous
Severity	Intense	Mild, chronic
Duration	15 minutes, hours, or days	Days, weeks, months or years
Direction of nystagmus	-Unidirectional -Fast to opposite	-Uni or bidirectional -Fast to same side
Associated symptoms	Often tinnitus and/ or hearing loss	-No auditory symptoms -Neurological symptoms
Direction of fall	Towards side of Lesion	Towards opposite side of lesion, variable
Visual fixation	Inhibits vertigo and nystagmus	No inhibition ,may accentuate nystagmus

1- Description of dizziness: the history should focus on the patient's exact description of his sensation in his own words because he often articulates a key word critical to the diagnosis. The patient should be asked if he experienced a rotational or spinning sensation which indicates a true vertigo. This description strongly suggests a peripheral or occasionally a central vestibular disorder. The sensation of lightheadedness or unsteadiness directs the clinician to other systems disorders like postural or orthostatic hypotension if associated with posture change, cardiovascular disorders if associated with exercise, multiple sensory deficit causes postural instability when walking or standing (more details in previous section of definitions). Blurred vision with head movement (oscillopsia) usually indicates bilateral otolithic vestibular function loss. A

history of stress, anxiety, depression, absence of organic lesion causing the dizziness, vague history or unable to describe feelings suggest a psychogenic etiology.

2- Severity of dizziness: if the initial attack of dizziness is typically severe and subsides with time, the cause is true for benign paroxysmal positional vertigo (BPPV), Meniere's disease, and acute viral labyrinthitis and mostly accompanied by nausea and/or vomiting. Less severe dizziness and continuous in intensity over months to years may arise from disease in any part of the body.

3- The pattern of dizziness: the patient should be asked about the typical episode duration if lasting seconds, minutes, hours, days, or persistent over weeks or months. Intermittent episodes with head movements and of seconds duration are usually seen in

BPPV and postural hypotension. An episode of Meniere's disease lasts hours while viral labyrinthitis episode lasts days. Persistent dizziness (weeks to months) are usually seen in metabolic disorders, drugs intoxication, or in psychogenic disorders.

4- Predisposing factors: patients who had a history of head trauma may develop sudden labyrinthine function loss or recurrent attacks of positional vertigo. Also, dizziness may be associated with ototoxicity and following viral upper respiratory tract infection, hypertension, diabetes, arthritis, gastrointestinal disturbances, previous surgeries, allergies of different sources. Alcohol consumption, smoking, caffeine, and spicy food can all exacerbate dizziness.

5- Precipitating factors: rapid head movements, bending over, turning over in bed, or changing position may aggravate the unilateral vestibular disease and trigger dizziness or vertigo. Coughing or sneezing can precipitate dizziness in cases of perilymph fistula. Dizziness caused by exercise indicates cardiovascular disease. Loud sounds (Tullio phenomenon) can cause dizziness in cases of vestibular fibrosis due to syphilis

6- Associated symptoms: localization of the cause of dizziness is much easier when otologic symptoms are associated. Episodes of fluctuating hearing loss with tinnitus, vertigo, and sensation of pressure or fullness in the ear are seen in Meniere's disease. Also, vegetative symptoms such as nausea and vomiting points to the inner ear as the cause of dizziness. Otorrhea associated with vertigo indicates acute suppurative labyrinthitis. Symptoms of neurological diseases associated with dizziness such as weakness, difficulty with speech, diplopia, or parasthesia suggest central vascular cause. Symptoms of cardiac disease such as

chest pain, breathing difficulty, or palpitations can be associated with dizziness. Other disorders can cause dizziness like ocular and visual disorders, multiple sclerosis, seizures, ataxia, or other gait disturbances. Headaches may suggest dizziness associated with migraines. The presence of these symptoms should provoke further laboratory and imaging investigations.

7-Past History and Review of Systems:

Patients should be questioned about the following:

□ **Visual acuity**, errors of refraction, glaucoma, cataracts, recent use of glasses and ocular muscles disorders.

□ **Chronic alcoholism** usually cause imbalance and dizziness due to vestibulospinal tract affection, and can also lead to malabsorption of vitamins from gastrointestinal tract with peripheral neuropathy effect.

□ **Vitamin B12 deficiency and diabetes** also affect the proprioception causing peripheral neuropathy.

□ **Tabes dorsalis** (tertiary syphilis affection of the posterior spinal columns) usually affect the proprioception. These patients often have difficulty walking in the dark.

□ **Cardiac diseases** are another important part of the history to question about, such as congestive heart failure, valvular insufficiency or stenosis, arrhythmias or infarction, conduction disorders or block.

□ **Psychogenic dizziness** is diagnosed when the patient reports several somatic problems while the history and physical examination exclude other potential organic causes.

8- Medication history: a thorough past

and current medication history should also be reviewed. Several ototoxic drugs should be asked about and discontinued in any patient complaining of dizziness or vertigo. These drugs include several aminoglycosides, furosemide, ethacrynic acid, amiodarone, quinine, acetylsalicylic acid, and cisplatinum. Antihypertensives, antidepressants, anticonvulsants, anxiolytics, antihistamines, and sedatives may cause dizziness. Exposure to potential toxins and environmental toxic agents can cause central nervous system damage.

9- Social history should also be questioned

about in patients complaining of dizziness including sexual activity, eating and drinking habits.

A common sense approach to the dizzy patient by using the “SO STONED” mnemonic was proposed by Floris L. Wuyts, Leen K. Maes and Vincent Van Rompaey. It represent: Symptoms, Often (frequency), Since, Trigger, Otology, Neurology, Evolution, and Duration. An overview of the different questions that should be asked to the dizzy patient is shown in the following table⁽²²⁾

SO STONED			
Dimensions	Questions	Targeted additional questions	
S	SYMPTOMS	What are the symptoms?	Vertigo, dizziness, nausea, postural instability, falls without syncope, falls with syncope, lightheadedness, rotatory or linear sensations, tilt of the vertical, oscillopsia, drunken feeling, lateropulsion, to-and-fro rocking,...
O	OFTEN	How often does "it" happen?	Daily (once or several times a day), weekly, monthly, irregularly, continuously, only once, only during the trigger
S	SINCE	Since when do you suffer from this problem? Both related to time and circumstances	A day, week, month, year, decade ago After a viral illness, a head trauma, a medical/surgical intervention, a journey on a boat, train or plane, without any clear cause
T	TRIGGER	What triggers the complaints/symptoms and what makes them worse, i.e., aggravating factors?	General head movements, walking, rolling over in bed, bending over, looking up, being a passenger in a car or plane, walking in supermarket aisles, walking in semi-darkness, coughing, noise, visual stimuli, or ... completely spontaneous
O	OTOLOGY	Do you experience any concomitant otological symptoms and when do these occur?	Hearing loss (fluctuating), tinnitus, aural fullness, hyperacusis, autophonia, draining ear, otalgia Before, during, or after the attacks, in between, long-lasting, i.e., independent of the symptoms
N	NEUROLOGY	Do you experience any concomitant neurological symptoms?	Headache, migraine (current and in the past), face or limb paresthesia, scotoma, phonophobia, photophobia, numbness, palpitations, hyperventilation, speech problems, diplopia, cervical problems
E	EVOLUTION	What is the evolution of the symptoms?	Persistent, improving, worsening, ups, and downs
D	DURATION	What is the duration of the symptoms?	Seconds, minutes, hours, days, continuously

“SO STONED “mnemonic used for simplifying the history taking in a dizzy patient⁽²²⁾

10- Physical and Functional Examination

A thorough physical and functional examination of the ear is an essential part of the examination of the dizzy patient. The examination includes the ear, nose, throat, ocular movements, the vestibular system, the neurologic system, the cardiovascular system, and the proprioceptive system.

These investigational examinations and testing are classified into three categories:

1- Office examination: otoscopy, nystagmus, oculomotor and funduscopy, tympanomandibular joints, cranial nerves, motor reflexes, blood pressure in supine and sitting positions, heart rate, respiratory rate, and temperature.

2- Simple clinical tests and maneuvers: tuning fork tests, fistula test, cerebellar function tests, Romberg test, gait, posture, toe-heel, past-pointing, Unterberger’s test, Babinski-Weil’s test, rebound test, head-shaking test, Hallpike’s positioning test, and hyperventilation test.

3- Specialized investigation and testing: including audiological, vestibular, neurological, cardiovascular, laboratory, and radiological evaluations. Details of these procedures will be in the next sections.

Ear, nose, and throat examination:

Any pathology involving the ears, nose, and throat must be ruled out. Vertigo may be caused by diseases of the external ear and middle ear, such as impacted wax and foreign bodies. Otoscopic examination reveals ear pathological conditions. Middle ear diseases and complications, may cause mild vertigo such as acute suppurative otitis media, acute

mastoiditis, and exacerbations of chronic suppurative otitis media (CSOM), while complications of CSOM with cholesteatoma may cause erosion of the bony labyrinth and the patient may experience sudden severe vertigo. This condition can be confirmed by the fistula test. Proper examination of the nose, throat, and larynx can disclose diseases or abnormalities in the function of the supplying cranial nerves. Temporomandibular joint should be palpated and auscultation of the area for hums and bruits is useful.

Neurologic examination:

Neurologic examination involves the cerebellar function, the cranial nerves, in addition to the examination of the vestibulo-ocular and the vestibule-spinal reflexes. These reflexes will be covered in the procedures and maneuvers section.

1- Cerebellar examination:

acute midline cerebellar disease causes truncal ataxia whenever the patient moves from rest, and intension tremor; while hemispheric cerebellar disease causes extremities ataxia of the same side revealed in the loss of fine motor coordination. The following tests are intended to evaluate these functions: the heel-to-toe (tandem gait) shows unsteadiness and ataxic gait, the finger-to-nose test and rapid alternating hands movement show dysmetria and dysdiadochokinesia (irregular and clumsiness of movements) respectively, and rebound test reveals inability to control limbs movements after releasing its restraint, and many other test modalities.

2- Cranial nerves examination:

examination of the areas supplied by the cranial nerves can detect abnormalities related with the symptom of dizziness. Fundoscopic examination frequently reveals many neuro-

otological and central nervous system disorders. Papilledema is usually observed bilaterally and indicates an elevation of intracranial pressure. Examination of the vestibulo-ocular reflex, visual acuity and field, papillary reactivity, oculo-motor function should be performed. Also, examination of corneal reflex, facial sensation and muscles movement, throat and soft palate movement, gag reflex, swallowing, shoulder mobility, and tongue mobility can provide valuable information in diagnosis of dizziness.

Cardiovascular examination:

Auscultation of the heart and carotid arteries should be performed because usually disorders of cardiovascular system are responsible of dizziness, mainly in the elderly patients. Heart murmur, irregular rhythm, and carotid bruit suggest the need for a cardiovascular work-up and follow-up of these patients. The positive findings are of particular importance in elderly patients, mainly those who are at risk for cerebrovascular accidents.

Measurement of blood pressures in supine and standing positions reveals the presence of orthostatic hypotension. Orthostatic hypotension is defined as a reduction of systolic pressure of at least 20 mmHg or diastolic pressure of at least 10 mmHg⁽²³⁾, or an increase in the heart rate of 10 beats per minute^(2, 24).

Finally, the patient should be asked to hyperventilate for 2-3 minutes and then asked whether his feeling associated with hyperventilation is similar to the dizzy symptom. If hyperventilation reproduces the symptom of dizziness, this symptom is most probably of psychogenic origin⁽²⁾. The following most common evaluations, tests, and disorders will be discussed briefly because

details are beyond the scope of this article and can be looked at in many different textbooks. Neurologic testing

In addition to electroencephalographic (EEG) recording, the neuro-ophthalmic and neuro-otologic tests (mentioned previously) are performed in dizzy patients. Abnormal EEG was seen in one third of randomly selected patients referred to specialized dizziness clinic⁽²⁵⁾.

Cardiovascular testing:

Electrocardiography (ECG), ambulatory ECG, echocardiography, angiography, and carotid Doppler examinations are very important in revealing different cardiac and vascular disorders like arrhythmias, paroxysmal atrial fibrillation, coronary disease, heart block, sinus arrest, valvular abnormalities, and hemodynamic disease.

Radiologic testing:

Routine plain X-ray images of petrous bone for the internal auditory meatus, sinuses, cervical spine in antero-posterior, lateral and oblique positions are of value in first line evaluation.

Computerized tomography (CT) and/or magnetic resonance imaging (MRI) are indicated when cerebellar vascular accidents (hemorrhage, infarction) are suspected. MRI with gadolinium enhancement is very useful in cases of intracanalicular acoustic neuromas, and in detecting lesions of demyelinating white matter of multiple sclerosis.

Christoph Best and Joachim Gawehn have studied the contradiction and correlation in MRI and neurophysiology in vestibular paroxysmia, which is the vestibular kin to trigeminal neuralgia. They used standardized high-resolution MRI with 3D CISS sequences

to detect that eighth cranial nerve is subjected to neurovascular compression in cases of vestibular paroxysmia VP, most commonly by anterior inferior cerebellar artery (75% of cases of VP)⁽²⁶⁾.

Selective cerebral angiography and/or magnetic resonance angiography (MRA) are very useful in visualizing vasculature of the brain in cases of cerebrovascular diseases.

Laboratory testing:

Although most routine laboratory tests had a very low yield in the evaluation of patients with dizziness; however, complete blood count, sedimentation rate, fasting blood sugar and glucose tolerance test, serum electrolytes, lipid profile, folate and vitamin B12, thyroid function, kidney function, urinalysis, and

serology for syphilis can be helpful in diagnosis of underlying causes of dizziness. Also serum uric acid SUA level might be included in the laboratory evaluation panel for vertigo; Elevated SUA is positively correlated with benign paroxysmal positional vertigo, with an unknown exact mechanism⁽²⁷⁾.

11-Procedures and Maneuvers

Balance testing usually involves stance, posture, gait, and eye movement tests. These tests include the well-known traditional procedures and maneuvers which test the vestibulo-spinal reflex (VSR) and the vestibulo-ocular reflex (VOR) through the postural and nystagmus tests respectively.

These tests are shown in Table (2).

Table 2: Balance tests using VSR and VOR

Vestibulo-spinal reflex (VSR) (postural tests)	Vestibulo-ocular reflex (VOR) (nystagmus)
<ul style="list-style-type: none"> - Gait tests - Tandem gait tests - Romberg test - Unterberger test - Babinski test - Barany's test 	<ul style="list-style-type: none"> - Physiologic nystagmus - Pathologic nystagmus 1- spontaneous nystagmus 2- positional nystagmus 3- induced nystagmus <ul style="list-style-type: none"> <input type="checkbox"/> gaze <input type="checkbox"/> fistula <input type="checkbox"/> positioning <input type="checkbox"/> head-shake <input type="checkbox"/> cervical <input type="checkbox"/> caloric <input type="checkbox"/> optokinetic

Stance, posture, and gait tests

Vestibulospinal system receives information from vestibular, visual, and proprioceptive systems. It involves many reflexes that act on many joints and muscle tension to keep the stability of the body posture. Many postural tests provide qualitative information on the integrity of this

system like gait, Romberg, Unterberger, Babinski-Weill, and Barany's pointing test.

Gait test: this test is not specific to any pathology. The patient is asked to walk in a straight line first with open eyes and then closed. A modification of the test is walking over a soft surface with eyes closed to deprive him from the proprioceptive and visual input

and the patient will fall down in case of absent vestibular function. Tandem gait is tested by asking the patient to place one foot directly in front of the other (the toes touch the heel of the other).

Romberg test: the patient is asked to stand unsupported with feet together and to close his eyes for few seconds. The test is positive if the patient tends to fall to one side. This indicates a recent peripheral vestibular disorder on that side or a posterior column disorder and central lesions with tendency to fall backwards.

Unterberger test: the patient is asked to stand upright and walk on the spot for 1 minute with closed eyes and arms stretched out in front of him horizontally, and to raise his knees alternately and repeatedly. Any rotation to one side of more than 45° is pointing towards the diseased labyrinth.

Babinski-Weill test: the patient is asked to walk 5 steps forward and 5 backward with closed eyes for 30 seconds. In vestibular disorder the patient makes a star shape deviating towards the diseased side.

Barany's pointing test: the patient is seated and asked to point to fixed point on the wall at one meter away and then asked to touch that point many times with eyes closed. In unilateral vestibular disorder, the patient deviates his pointing to one particular side.

Ocular movements tests

The vestibulo-ocular system is tested through the vestibulo-ocular reflex (VOR) by looking to the involuntary eye movements (nystagmus) and the electrical recording of these movements which is called electronystagmography (ENG) or videonystagmography (VNG).

Nystagmus: is a rhythmic involuntary

oscillating movement of the eyes. It is the only objective sign of vertigo, with a fast component, which is a corrective central phase, in one direction and a slow component, which is caused by the diseased labyrinth, in the other direction (jerky). The nystagmus can be horizontal, rotatory, or vertical. Also, nystagmus can be pendular of equal components as in ocular pendular nystagmus caused by blindness, albinism, aniridia, or opacities; congenital familial pendular nystagmus; or acquired pendular nystagmus caused by brain disease such as multiple sclerosis, stroke, or following encephalitis. Balance is not affected in ocular and congenital nystagmus. Vestibular nystagmus can be physiological or pathological. The pathological can be spontaneous, positional or positioning (table 2)

Physiological nystagmus: it is seen during environment movement when looking through a window of moving railway carriage. In this situation, the visual sensation is not accompanied by concomitant vestibular and somatosensory movement cues. This form of nystagmus is called optokinetic nystagmus.

Spontaneous nystagmus: this nystagmus is of great importance and is seen when the patient is looking straight ahead and the head is in a normal upright position. Also, this term applies to that occurring when gazing to one side. It is first degree when eyes are gazing in the direction of fast phase; second degree when eyes are gazing straight ahead; and third degree when eyes gaze in all directions. This acquired spontaneous nystagmus may be of peripheral or central vestibular causes with different features (table 3). Frenzel glasses are used to magnify fine eye movements and to prevent visual fixation.

Table 3: Spontaneous nystagmus in peripheral and central pathologies

	Peripheral	Central
Visual fixation	Decrease nystagmus	Not affected or may increase
Form	-Horizontal / Rotatory -Bilateral (both eyes)	-Any form, may change ,vertical -Usually unilateral
Vertigo	Persent	Variable, unsteadiness
Past-pointing and falling	Towards slow phase	Towards fast phase
Direction of nystagmus (Fast component)	Towards the opposite side of the lesion	Towards the same side of the lesion
Associated symptoms	Often auditory	Often neurological

Positional test nystagmus: in this test the patient is asked to lie down and assume a supine position quietly (head supine) for 30 seconds, then ask him to lie on his left and right side positions for same duration. Characteristics of this nystagmus, if present, are shown in table 3 like those of positioning test nystagmus.

Positioning test nystagmus: this is best seen during **Dix-Hallpike maneuver** in which the nystagmus is elicited by rapidly

positioning the patient from sitting to supine head-hanging backward, head-hanging right, and head-hanging left for 30 seconds each position. The nystagmus is best observed using Frenzel glasses. This maneuver is of particular importance in cases of posterior semicircular canal benign paroxysmal positional vertigo BPPV. Differentiation between peripheral and central vestibular caused nystagmus during positioning test is shown in table 4.

Table 4: Positional Nystagmus in peripheral and central pathologies

	Peripheral	Central
Latency	2-20 seconds	No latency
Duration	Disappears in 50 seconds	Lasts >1 minute
Fatigability	fatigable with repetition	Non fatigable with repetition
Position	Present in one head position	Present in multiple positions
Direction	One direction when lesion in undermost ear	Different directions in different positions
Vertigo	Always present and severe	Occasionally present and mild
Incidence	85% of all positional vertigo	10-15%

The supine roll test (Pagnini McClure maneuver) is also important, especially in diagnosis of cases of horizontal semicircular canal BPPV⁽²⁸⁾.

Fistula test: this test is performed using a

Siegle otoscope with a tight seal speculum and pneumatic bulb to puff air into the ear canal. Also, it is done by pressing on the tragus against the external canal meatus to increase the pressure in the canal, or by using the

tympometer probe to apply pressure. A positive fistula test occurs when nystagmus beats towards the same side in case of positive pressure or to the other side in case of negative pressure. This sign is seen in bony labyrinthine erosion from cholesteatoma, or in rupture of oval or round window membrane from barotraumas or other straining conditions.

Head-shaking test: it is performed either actively (the patient shakes his head) or passively (the examiner shakes the patient's head) with a frequency of 1 cycle per second or more for at least 20 cycles in the horizontal plane back and forth and suddenly stopped. The nystagmus is usually observed beating away from the affected side.

Caloric test: caloric test is the only test that stimulates each labyrinth separately. It is performed by irrigating the external canals of the patient, in a supine position with the head flexed 30 degrees, with water (or air in perforated drums) over 40 seconds at 30° C and 40° C each. Nystagmus duration is calculated from the beginning of irrigation until it disappears, or the degree of slow phase is recorded as part of electronystagmography recordings. Responses are compared between ears and between the direction of the right beating and the left beating nystagmus. A unilateral weakness or canal paresis indicates the presence of a peripheral vestibular lesion. Bilateral weakness is commonly seen in bilateral labyrinthine affection such as ototoxicity and bilateral Meniere's disease. Directional preponderance of nystagmus is rarely localizing finding, but usually points towards the side of central lesion and away from the peripheral lesion.

Cervical vertigo test: the clinical differentiation of cervical vertigo from vertebrobasilar insufficiency (VBI) is difficult.

VBI is usually caused by atherosclerosis of the subclavian, vertebral, or basilar arteries, while cervical vertigo is caused by vertebral involvement when the neck is turned or extended. In both conditions there is transient ischemia of the labyrinth and brainstem which is prolonged in VBI to several minutes. The most common presenting feature is vertigo which may be isolated symptom or associated with blurring of vision, weakness, confusion, dysarthria, drop attack and other neurological symptoms. Cervical vertigo and nystagmus is precipitated by neck movements and occipital pain due to cervical root compression. Neck torsion test usually reproduce this picture

Head thrust test: also called head impulse test HIT. It can provide information about the vestibular ocular reflex that compensates for a change in head position. And it is very sensitive for identifying uncompensated unilateral vestibular hypofunction. It is done by asking the patient to fix his eyes on a static target, and then the head is moved quickly to the right or left in the plane of lateral semicircular canals. When the head is moved towards the affected vestibular system, the eyes show a corrective saccade trying to fixate on the visual target.

12- Specialized Investigation and Testing

Clinical evaluation of the dizzy patient, mainly history and physical examination usually guide the clinician towards the consideration of further diagnostic testing or referral to proper specialties. Several diagnostic testing can be ordered, including audiometry, vestibulometry, neurologic testing, cardiovascular testing, radiologic imaging, and laboratory testing.

Audiologic testing

Audiologic testing includes pure tones air

and bone audiogram, tympanometry with ipsi- and contralateral stapedial muscle reflexes and reflex decay tests, speech reception threshold and speech discrimination scores. Site of lesion tests for recruitments and adaptation like tone decay test, short increment sensitivity index, and alternate binaural loudness balance test are useful. Brainstem evoked response audiometry and glycerol test are significant diagnostic tests.

Vestibular testing

Vestibular testing includes posturography, rotation tests, vestibular evoked myogenic potentials (VEMP), and the most routinely clinically useful electronystagmography (ENG) tests. ENG is a procedure in which we record the eye movements in response to gaze pursuit, saccadic and optokinetic eye movements, vestibular, positional, cervical, rotational, and bithermal caloric stimulation. Recordings are achieved through electrodes affixed at the outer canthi of both eyes for horizontal eye movements and above and below eyes for vertical movements. ENG has good sensitivity and specificity for peripheral and central disorders⁽²⁹⁾. Other investigators indicated that ENG does not consistently distinguish peripheral from central disorders^(30, 31).

VEMP reflexes appear sensitive to the

hydropic structural changes in the saccule of patients with Meniere's disease and is therefore a potential detector of symptomatic and asymptomatic endolymphatic hydrops⁽³²⁾.

Conclusion

This review summarizes the basic existing data about concepts of balance, causes of dizziness, and most importantly how to approach the dizzy patient step by step. In an organized systematic approach, starting from the most important part which is diligent history taking; focused questioning in most of the cases can provide the best guide to reach a diagnosis. Followed by meticulous physical examination, then investigations and special maneuvers guided by the preceding history and examination. All of the aforementioned steps are proved essential in narrowing our differential diagnosis list, consequently avoiding unnecessary investigations.

However, despite all of the research conducted on dizziness, it remains a challenging medical complaint. More well-designed research studies are needed, which focus more on the true pathogenesis, and finding new cost-effective and efficient methods to investigate patients, in order to more effectively direct treatment and rehabilitation.

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كيفية التعامل مع مرضى الدوخة

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الملخص

تعتبر الدوخة إحدى الأعراض الطبية المزعجة للطبيب والمريض التي يواجهها الأطباء حول العالم. وبالرغم من التقدم العلمي في التحريات المخبرية والشعاعية وبالإضافة إلى التقدم التكنولوجي في فحوصات التوازن، فإن المعرفة العميقة للمبادئ الأساسية تعتبر حجر زاوية في فهم توازن الجسم.

وفي هذا المضمون نسعى إلى إرساء خطة منهجية للتعامل مع حالات الدوخة من خلال تزويد القارئ بمراجعة أهم المبادئ الأساسية وفهم أنواع الدوخة المختلفة والسيرورة المرضية المفصلة والفحص السريري والمخبري بالإضافة إلى الإجراءات الكلاسيكية لتقييم جهاز التوازن من خلال ما تملئها السيرورة المرضية والفحوصات المخبرية.

إن استعمال الطريقة السالفة الذكر في التعامل مع مريض الدوخة تساعد الطبيب المعالج في تشخيص ومعالجة غالبية الأمراض المسببة بدون اللجوء إلى إجراء الفحوصات غير الضرورية من مخبرية وشعاعية وتوازنية.

الكلمات الدالة: دوخة، دوار، توازن