VERTIGO - AND WHAT IS NEW IN IT FROM THE GENERAL PHYSICIAN’S PERSPECTIVE

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VERTIGO is probably the greatest heart sink symptom that ‘Can change a healthy and active individual into a helpless invalid and a rational physician into a babbling idiot’. Though medically defined as a subjective sensation/hallucination of movement either of the self or of the surroundings, it is one of the scariest experiences that a person can have and may be either a feeling of rotating or spinning or a sensation of imbalance, instability, muzziness, dizziness, lightheadedness, sinking sensation etc. It generally but not always indicates a disorder in the balance system and is one of the commonest symptoms for which a patient presents to the doctor. Current statistics say that 5% of all patients going to the general physician and about 10% of patients going to neurologists and ENT specialists present with vertigo. It is the second most common symptom among old aged patients and more than 50% of all patients about the age of 60 years who have a history of falls have some disorder in the balance system. Patients presenting with either vertigo or imbalance are in medical parlance called ‘balance disorder’ patients. Though patients having a sinking sensation, lightheadedness or blackouts also present to the doctor complaining of vertigo, yet these specific symptoms do not usually suggest a disorder in the balance system. They suggest syncope or pre-syncope. The discerning physician should be able to differentiate between a balance disorder which indicates a defect in the vestibular system from syncopal and pre-syncopal conditions which are usually manifestations of disorders in the cardiovascular and neurological systems are not due to disorders in the vestibular system. Some visual disorders too like defects in the extra-ocular muscles or persons with refractive errors can also present to the doctor with ‘vertigo’. Current experience shows that only about 60% of patients who present with vertigo/imbalance to the doctor actually have a definite disorder in the balance system. Some psychological disorders and some systemic disorders like anemia, hypotension (not hypertension), cardiac arrhythmias, metabolic and endocrine disorders like diabetes and hypothyroidism and autonomic disorders too can present only with dizziness/giddiness to the doctor.

Modern medical science has established that balance disorder patients do not have just a rotating/spinning sensation or imbalance. They have a lot of other problems like irrational behavior, poor concentration, forgetfulness etc.

They have COGNITIVE deficits and show poor cognitive skills in the domains of memory, concentration, arithmetic and reading; they also have psychological and emotional disorders. So the updated, modern physician should not look at a patient presenting with balance disorder as just having a rotating spinning sensation or imbalance only; they had to appreciate that VERTIGO or IMBALANCE is just one of their many problems, even though they may have presented just with the rotating/spinning sensation or the imbalance and may not have reported of other problems. Treating just the rotating spinning sensation is not going to solve the patient’s problem totally. So today’s vertigo patient is a package of disorders in the vestibular system, cognitive system and psychic system not necessarily all together in the same proportion. Psychological and cognitive impact of balance disorders is now medically established and will be discussed very briefly in this write-up too.

MAINTENANCE of BALANCE as we understand today may be summarised as this:-

CNS collects information about static/dynamic position of the body in relation to the ground and

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the surroundings from certain sensors in different parts of the body. Information from the different sensors is then integrated in the brain and compared with previously stored experiences. A very precise, coordinated and accurately timed motor output is then generated reflexly which contracts some specified muscles and restores balance. The inputs to the balance system come from different sensors viz.:

Vestibular labyrinths

Eyes

Proprioceptors

From these sensory inputs the brain perceives the static and dynamic position of the body in relation to the ground and the surroundings and after comparing it with previously stored experiences which are stored in the vestibular memory in the brain the brain evolves a motor output directed to-

• muscles of LIMBS / TRUNK /NECK through VESTIBULO-SPINAL reflex system and.

• muscles of the EYES through VESTIBULO-OCULAR reflex system.

• Cerebellum fine tunes the motor output.

• Cognitive system determines the nature of the response.

COGNITION and ‘cognitive system’ are terms to which many of us are not very much acquainted with. But current understanding of the mechanism of maintenance of balance and modern management of balance disorders necessitates a basic understanding of cognition and cognitive processes on the part of the clinician. This is so as, cognition has now been understood to have a major role in the maintenance of balance and current research has established beyond doubt that disorders of the vestibular system induce cognitive deficits.

COGNITION is the highest level of mental information processing in the brain and consists of the actions of:-

• first acquiring knowledge through the senses of sight-smell-sound-touch-taste-balance.

• then using the acquired knowledge to achieve a desired goal.

Past experiences stored in the memory are retrieved to contemplate what the future could be and what could be the consequences of the action and accordingly the action is executed.

Components of Cognition are perception, memory, attention, reasoning, judgment, problem solving and execution of an action. The maintenance of balance involves all these components of COGNITION and is very much a cognitive process according to present day knowledge as explained below.

Maintenance of Balance consists of:-

• Understanding (acquiring knowledge) of ongoing reality through the visual, proprioceptive and vestibular senses – which is perception.

• Establishing coherence between these different sensory inputs and by comparing with previously stored experiences – which is integration and memory recall.

• Integrating the inputs in the brain to comprehend the reality about the stability of the ground and the surroundings with memorization of the experience - which is storing in memory and prediction of the expected forthcoming reality.

• Executing a motor action based on the integrated inputs to maintain stability and prevent a fall – which is execution of a programmed response.

Maintenance of balance is hence a real cognitive process and involves the highest levels of information processing in the brain.

Maintenance of balance involves:-

• Adaptation to the ongoing reality and storing in the brain (memorisation of) experiences learnt pertaining to the maintenance of balance.

• Prediction of the expected response by comparing with the previously stored experiences.

• Innovating (usually by intuition) newer strategies to maintain balance when similar experiences are not stored in the brain or when contradictory inputs are received in the brain.

All of these are cognitive process and require a very high degree of cognitive skills.

Cognitive problems in Vestibular Disorder Patients as accepted by modern medical science are:-

• Topokinetic memory deficit.

• Spatial working memory deficit.

• Abnormal levels of anxiety and depression.

• Other cognitive problems like poor memory with numbers i.e., arithmetic skills etc.

DIAGNOSTICS IN VERTIGO

Dagnosis of any medical disorder today consists of localising the lesion anatomically, ascertaining the functional deficit qualitatively and quantitatively i.e., evaluating and documenting the physiological deficit and finally ascertaining the etiology i.e., the cause of the disorder.

Anatomical areas that can screw up the balance system are:-
• vestibular labyrinths comprising of 3 semicircular canals, saccule, utricle
• vestibular nerve with the sup. and inf. vestibular nerves
• vestibular nucleus
• brainstem
• cerebellum
• vestibular cortex
• eyes
• spinal cord
• peripheral nerves
• skeletal and extra-ocular muscles

Each of these organs may be affected by a number of different diseases having varied aetiologies; e.g., the inner ear can be affected by diseases like Meniere’s disease in which there is collection of fluid in the inner ear, BPPV in which certain particles are dislodged in the inner ear, labyrinthitis in which there is an inflammation of the inner ear, ototoxity in which there is toxic damage of the vestibular cells in the inner ear, presbyacusis in which there is a age-related degeneration of the hair cells in the inner ear and so on. Each of them may present just with vertigo but will require completely different treatments. Ménière’s disease will have to be treated by diuretics, BPPV does not require any medication and has to be treated by physical therapy only, labyrinthitis will require anti-infective agents like antibiotics or antivirals. There is no blanket therapy for vertigo and there is no single drug that can treat all types of vertigo as they are all off different aetiologies. There are more than 100 medical disorders of different etiopathologies that can present to the doctor only with vertigo or imbalance and so many different anatomical organs as listed above and biological systems involved in the maintenance of balance disorders of which can cause vertigo/imbalance, that very often it does become pretty difficult to identify the cause and the anatomical site of lesion. But without a precise diagnosis of the etiology and the anatomical site of lesion, ethical and corrective treatment i.e., a ‘cure’ is just not possible. The discerning clinician has hence to be very careful when confronted with a patient suffering from vertigo/imbalance.

Subject gets sensation of Vertigo / Imbalance if one or more of the following physiological processes are jeopardised:-
• Functional defect in the Eyes / Vest. Labyrinth / Proprioceptors
• Mismatch between the information obtained from these 3 sources
• C N S fails to integrate the afferent information from these 3 sources.
• C N S fails to generate the motor output.
• Functional defect in the motor output system, i.e. in the nerves and muscles of the eyes / limbs / trunk / neck

The clinician’s job is to find out which of these above systems is at fault

Differential diagnosis in vertigo is quite a difficult task and entails the three following steps:-

Step I
Differentiation between CENTRAL and PERIPHERAL lesions
Step II
Localisation of the SITE of LESION
Step III
Determining the ETIOLOGY
The aim of history taking, clinical examination and investigations is first to find out if the patient actually has a balance disorder or not, and if yes, then ascertain whether it’s a central or a peripheral disorder, locate the site of lesion and find out the aetiology.

History taking is the most important and consists of noting the nature of complaints that is whether this symptom actually is turning / rotating / instability / blackouts, identifying the precipitating factors, finding out the duration of symptoms that is how long the symptoms last whether it is moments / minutes / hours / days / months, ascertaining the mode of onset -sudden / gradual, noting the progress of the symptoms that is whether the condition is deteriorating / improving / episodic, finding out the accompanying features like whether it is accompanied by aural symptoms like deafness / tinnitus / fullness of the ears and if there are CNS symptoms like headache / diplopia / motor-sensory disturbance.

After a thorough history taking is done, it is necessary to evaluate clinically the balance system and it comprises of examining parts of central and peripheral nervous system, the eyes, the vestibulo-spinal reflex system, the vestibulo-ocular reflex system, the cerebellar system and if possible also to evaluate the cognitive function.

Once the history taking and clinical examination is complete, the next part is investigating the patient. The clinician needs to understand here that investigating the balance disorder patient requires a very sophisticated high-tech and time-consuming costly investigations the facilities of which may not be available everywhere. However, it is not essential that each and every patient presenting with vertigo or imbalance needs to undertake all these investigations. The investigations are basically for accurately ascertaining the structural and functional integrity of the vestibular system and documenting them. Though it would be excellent to investigate all patients of vertigo or imbalance yet it is not essential in all patients and if a very thorough history taking and clinical examination is done without compromising on the time and the commitment that it deserves, the high-tech investigations for evaluation of the vestibular system is required in only about 10% of the patients. The enlightened and updated modern physician should be able to advise the correct investigations to the patient.

Investigations in a balance disorder patient

The BALANCE system may be investigated by

- Assessing the integrity of the vestibular reflexes by VES-

TIBULAR FUNCTION tests namely the -VESTIBULO-OCULAR reflex by electr

ENG / videonystagmography (VNG)

and

the VESTIBULO-SPINAL reflex by cranio

CCG / computerised dynamic posturography (CDP) / vestibular evoked myogenic potential is (VEMP) / Stabilometry

- Monitoring the electrical activity in the brain when a vestibular stimulus is presented by BEAM, VbEP.

- Imaging the structures of the vestibular system that may be of two types namely organic imaging by- MRI, CT-Scan, X-Ray and functional imaging by PET and SPECT or where possible functional MRI called f-MRI.

- Evaluating blood flow in the posterior circulation of the brain by transcranial Doppler (TCD)

The basic tests that the balance disorder patient needs to undergo are:

1. Either ENG or a VNG to evaluate the vestibulo-ocular system. The VNG if properly done is always a much better option as it evaluates the functioning of the oculomotor system more precisely; evaluation of the oculomotor system is very important as most central vestibular disorders are manifested by oculomotor disturbances. Oculomotor disturbances are abnormal movements of the eyes. VNG picks them up and documents them better as the resolution and speed of recording is higher with VNG as compared to that of ENG.

2. Some test of posturography to evaluate the vestibulospinal system. The CCG is a crude but very simple way of evaluating the vestibulospinal system. Computerised dynamic posturography is a much better and sophisticated way of doing so but it is a costly apparatus and very few centres are equipped with this. The VEMP test does not evaluate the entire vestibulospinal reflex system but very precisely ascertains the function of the saccula which is a part of the vestibular labyrinth and the vestibulo-colic reflex which is a part of the vestibulospinal reflex.

3. A structural imaging of the brain by MRI though very commonly advised by medical consultants and neurologists in balance disorder patients is not really that informative. MRI of the brain is indicated if there is any clinical suspicion of a structural disorder like a tumour or bleeding/infarction in the brain. Balance disorders are very rarely caused by structural lesions and hence positive findings in MRI of the brain are very rare in patients presenting with vertigo/imbalance. Balance disorders are usually caused by very subtle metabolic or degen-
erative functional changes microscopic vascular lesions that are invisible to the most sophisticated MRIs. For balance disorder patients, an MRI is a better option than a CT scan and is an imaging is thought necessary by the clinician; it is prudent to go in for an MRI and not a CT scan of the brain.

CURRENT PERSPECTIVES IN VERTIGO MANAGEMENT

Objectives of management of balance disorder patients are:

- Diagnose the cause of the vertigo and treat the cause of the vertigo
- Provide symptomatic relief – taking care of the inherent ill-effects of anti-vertigo drugs
- Diagnose the cause of the vertigo and treat the cause of the vertigo
- Restore the deranged balance function
- Try to improve the neuronal metabolism, improve cognition and correct any concomitant psychological disorder

The updated clinician has to understand and appreciate certain truths about the balance system enumerated below so that he can deliver the best available and the most judicious and ethical treatment to his patients suffering from balance disorders.

Some hard facts relevant to therapy of Vertigo

- Special sensory epithelium is non-mitotic; dead vestibular cells do not regenerate. No medicinal agent specially the antivertigo drugs cannot and do not regenerate the dead vestibular cells after there has been a vestibular assault
- Restoration of deranged balance function after the vestibular labyrinth is damaged is possible only by vestibular compensation which is a natural process
- Vestibular compensatory mechanism is enhanced and expedited by specific physical therapy like the Cawthorne-Cooksey exercises, some yogic asanas and by some Tai Chi exercises
- Drugs that depress the CNS jeopardise the central vestibular compensatory mechanism and inhibit compensation and are hence is best avoided
- Peripheral vestibular disorders are usually self-limiting
- Vertigo / imbalance is just a symptom or manifestation of an underlying disorder; the causative pathology needs to be known for actual treatment
- Symptomatic treatment with anti-vertigo drugs may relieve symptoms but will not cure the causative disorder
- Objective of management is to correct the cause, (not merely suppress the symptom by indiscriminate and unethical use of anti-vertigo drugs) and to promote vestibular compensation. Enhancement of the vestibular compensatory mechanism is the mainstay of treatment for restoration of the deranged balance function; but at the same time requisite therapy to correct the cause of the balance disorder needs to be undertaken

- Psychotropic drugs and cognition enhancing drugs have a definite role to play in the management of balance disorders as psychic disturbances and cognitive deficits are present as comorbid conditions in most balance disorder patients
- Neurotropic drugs, antioxidants, drugs that enhance cerebral blood flow have all been found to have positive effects in many balance disorder patients.

The enlightened clinician must keep in mind the above-mentioned objectives of management of vertigo/imbalance and the hard facts outlined above when managing a balance disorder patient. He has to appreciate that balance disorder patients are mentally apprehensive and are extremely anxious and he has to reassure them by explaining the benign nature of the disorder and counsel them properly. He has to impress upon the patient the necessity of undertaking the physical exercises very diligently. As regards pharmacotherapy, the clinician has to be extremely cautious when prescribing the symptom relieving antivertigo drugs. These drugs namely cinnarizine, meclizine, dimenhydrinate, prochlorperazine, betahistine and diazepam called vestibular sedatives provide symptomatic relief either by inhibiting the vestibular nuclei or by blocking the receptors in the cholinergic pathways or by sedating the central nervous system. All these three processes inhibit the vestibular compensatory mechanism and are detrimental to the patient in the long run. As already explained, the restoration of deranged balance function takes place wholly and solely through the vestibular compensatory mechanism which is a natural process of normalising the balance function and if this natural process is jeopardised the patient’s balance function will never become normal. The antivertigo drugs are useful only in the first few days when the patient is having a severe rotating spinning sensation with or without nausea/vomiting and other vegetative symptoms which no doubt he is a traumatic experience for the patient. But these acute symptoms usually regress within the first few days and these vestibular sedatives are not at all needed after the very acute symptoms have subsided. A general rule of the thumb to follow is never ever to prescribe these drugs for more than seven days at a stretch except for some very rare cases. Providing symptomatic relief for the first few days suffices in most cases as these peripheral vestibular disorders are self-limiting conditions; therapy with anti-vertigo drugs MUST be discontinued after acute symptoms subside and not continued eternally. The best drug for symptomatic relief is prochlorperazine. It has anticholinergic and antidopaminergic effects and hence not only relieves the patient from the very
debilitating rotating/spinning sensation but also from the accompanying vegetative symptoms. In the very rare cases where an antivertigo drug needs to be continued for more than five days, betahistine in suitable dosage is a judicious choice as it is recognised as the only non-sedating antivertigo drug that does not depress the central nervous system and hence does not jeopardise the vestibular compensatory mechanism. This however does not mean that even betahistine can be continued eternally as very much like the other antivertigo drugs, it too is at best a symptom relieving drug that does not reverse the causative pathology. Though it is claimed to have some curative effect in Menière’s disease, yet this is controversial; moreover Ménérie’s disease is actually quite a rare cause of vertigo even though the diagnosis of Ménérie’s disease is rampantly used by many clinicians as a dumping ground for all patients suffering from vertigo/imbalance. Betahistine inhibits the vestibular nuclei and thereby reduces the sensory conflicts in the balance system. Sensory conflicts is one of the main stimuli for enhancement of vestibular compensation, more the sensory conflicts more will be the vertigo felt by the patient and better will be the vestibular compensation.

It will not be out of place to mention here the role of psychotropic drugs in the management of vertigo. Medical research has shown that psychic disorders are very common in balance disorder patients and that psychotropic drugs do have a positive role to play in the management of many balance disorder patients. The uncertainty of severity/timing of the vertigo attack and inefficiency of diagnosis/treatment leads to anxiety, helplessness, panic disorders, agoraphobia, somatisation, depression in a very huge portion of balance disorder patients. Psychologic responses to dizziness can retard recovery and start a vicious circle of persistent dizziness and psychological disturbance each helping to perpetuate the other. Dizziness becomes chronic in patients who react negatively to the vertigo.

Anxiety and panic caused by the vertigo increases autonomic symptoms one of which is dizziness. Dizziness augments the autonomic symptoms. This vicious cycle has to be broken and that is possible only if both the balance disorder as well as the concomitant psychologic disorder is treated simultaneously. There is a deep interrelationship between vestibular disorders and psychiatric disorders. It has been found that psychiatric patient (esp. schizophrenics) are more susceptible to motion sickness; schizophrenic patients have higher incidence of abnormal findings on vestibular function test; dizziness/instability is one of the common features of panic attacks; incidence of definite psychiatric disorder is very high in patients with proved vestibular dysfunction; vestibular disorder patients have very high incidence of abnormality in psychometric test. Better clinical outcome is obtained when psychotropic drugs are combined with vestibular drugs in many patients of vertigo. Not only those now neuroanatomical connections have been established between vestibular and autonomic nervous systems. All these justify the use of psychotropic drugs in correctly selected patients of vertigo. This of course is not to suggest that each and every patient of vertigo needs to be treated with psychotropic drugs but a much better outcome of treatment is obtained in a lot many patients when psychotropic drugs like SSRIs and benzodiazepines are used.

Our understanding of the maintenance of balance, it’s disorders and the management of these disorders has undergone a sea change in the last two decades. The current mode of treatment is not to suppress the disease by symptom relieving antivertigo drugs but to diagnose the underlying cause of the vertigo and then treat the cause. Physical therapy is now considered as the mainstay of treatment in the management of balance disorders. A detailed history taking, clinical examination and the sophisticated vestibular function tests ensures that the underlying disease which is being manifested as vertigo/imbalance is perfectly diagnosed by the astute clinician. Once the underlying disease is diagnosed be it a positional vertigo like BPPV, or Ménérie’s disease, or multiple sclerosis or migraine related vertigo or a psychic condition like phobic postural vertigo, a curative treatment is possible in most if not all cases of vertigo/imbalance.