



## Review Article

## Scrupulously managing vertigo

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## ABSTRACT

Vertigo is a sense of spinning dizziness. There is no ideal medicine for treatment of vertigo and dizziness. The duration of dizziness/vertigo: attacks may last for seconds or minutes (as in vestibular paroxysm) or hours (as in Menière's disease or vestibular migraine). Diagnosis and treatment of vertigo remains a challenge for many physicians. Many drugs produce dizziness and vertigo side effects such as some antibiotics, diuretics, mucolytics and NSAIDs. Symptoms of Vertigo are usually managed with vestibular suppressants. Steroids are useful in selected patients. Neurosurgical treatment is chosen in lesions such as hematomas, tumors, vascular lesions, pathology of the cervical spine (cervical spondylopathy)

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## 1. Introduction

A sensation of motion in which the individual or the individual's surroundings seem to whirl *dizzily*. Is colloquially labelled Vertigo. Apart from dizziness, there are issues with balance, motion sickness, nausea and vomiting, headache, and feeling of fullness in the ear. Vertigo is a hallucination of movement. It is typically but not necessarily rotatory and suggests a lesion in the vestibular system.<sup>1,2</sup>

## 1.1. Types of vertigo

Vestibular vertigo accounts for about a quarter of dizziness complaints and has a 12-month prevalence of 5% and an annual incidence of 1.4%. Its prevalence rises with age and is about two to three times higher in women than in men.<sup>3</sup>

## 1.2. Causes of vertigo

## 2. Cerebrovascular Accidents

The central cause of dizziness is acute ischemic event in the posterior fossa. The symptoms and signs vary depending on the location of the Ischemic event Vertigo is among the

initial symptoms in 48% of patients with stroke but stroke is diagnosed in less than 5% of patients presenting with dizziness.<sup>4</sup>

## 3. Clinical Conditions leading to Vertigo

## 3.1. Benign paroxysmal positional vertigo

The symptoms of BPPV include dizziness or vertigo, light headedness, imbalance, and nausea. The signs and symptoms of BPPV can come and go and commonly last less than one minute. Activities which bring on symptoms will vary among persons, but symptoms are almost always precipitated by a change of position of the head with respect to gravity. BPPV is mainly encountered in persons of advanced age. (Aminoglycosides Streptomycin) have long been known to be ototoxic and may also be vestibulotoxic.

## 4. Acute Labyrinthitis

Its an inflammatory disorder of the inner ear, or labyrinth. Bacteria or viruses can cause acute inflammation of the labyrinth in conjunction with either local or systemic infections. Autoimmune processes may also cause labyrinthitis. Symptoms include:, dizziness, vertigo, loss of balance, nausea and vomiting.<sup>5,6,7</sup>

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**Table 1:**

<b>Symptoms</b>	<b>Peripheral Vertigo</b>	<b>Central Vertigo</b>
Nystagmus	Combined horizontal and torsional, inhibited by fixation of eyes, decreases over several days , no changes with gaze change	Purely vertical , horizontal or torsional not inhibited by gaze fixation, lasts for weeks or months , changes with change in gaze direction
Imbalance	Moderate one direction , no changes in gait	Severe, unable to stand and walk
Nausea and Vomiting	May be severe	Variable
Hearing loss or tinnitus	Common	Rare
Neurological symptoms	Rare	Frequent
Latency of nystagmus in provocative diagnostic test	Longer ( >20 Secs)	Shorter ( <5 Secs )

**Table 2:**

<b>Peripheral causes of vertigo</b>	<b>Central causes of vertigo</b>	<b>Systemic causes of vertigo</b>
Benign paroxysmal positional vertigo	Vascular: vertebrobasilar transient ischemic attacks, cerebellar or brain stem stroke	Drugs and toxins (including anticonvulsants, hypnotics, antihypertensives, alcohol, analgesics, tranquilizers, quinine, ethacrynic acid, aminoglycoside antibiotics)
Vestibular neuronitis	Cerebellopontine angle tumors: acoustic neuroma, meningioma, cholesteatoma, metastatic tumor	Hypotension, presyncope
Recurrent vestibulopathy	Demyelinating disease: multiple sclerosis, postinfectious demyelination	Infectious diseases (including syphilis, viral and other bacterial meningitides, and systemic infection)
Meniere's disease	Cranial neuropathy: focal involvement of VIII nerve or in association with systemic disorders	Endocrine diseases (including diabetes and hypothyroidism)
Head trauma	Intrinsic brainstem lesions: tumor, arteriovenous malformations	Vasculitis (including collagen vascular disease, giant cell arteritis, and drug-induced vasculitis)
Otosclerosis	Seizure disorders	Other systemic conditions (including haematological disorders [polycythemia, anemia, and dysproteinemia], sarcoidosis, granulomatous disease, and systemic toxins)
Perilymph fistula	Hereditary disorders (such as spinocerebellar degeneration)	
Aminoglycoside ototoxicity		

**Table 3: Drugs causing vertigo as adverse event**

<b>Drug Classification</b>	<b>Examples</b>
Antimicrobials	Ciprofloxacin, Gentamicin, Tobramycin , Azithromycin, Clarithromycin
Antihypertensives	ACE inhibitors
Analgesic	NSAIDs
Antihyperlipidemic	Simvastatin, Atrorvastatin
Antipsychotics	Clozapine, Thioridazine
Antifungals	Fluconazole .Amphoterecin B
Antiparkinsonian drugs	Bromocriptine

**Table 4:** Drugs for reducing symptoms of vertigo

Condition	Treatment	Dose / Procedure
Benign Paroxysmal Positional Vertigo	Meclizine	25-50mg , 4-6 hourly / Epley manoeuvre , Vestibular Rehabilitation
Meniere's Disease	Salt Restriction Diuretics	Intratympanic Dexamethasone Endolymphatic sac surgery
Vestibular Neuritis	Methylprednisolone 100 mg orally daily then tapered to 10 mg orally daily over three weeks	
Migrainous vertigo	Migraine prophylaxis with serotonin receptor agonists (triptans)	

**Table 5:** Exercises in peripheral vertigo

Condition	Exercises
Benign paroxysmal positional vertigo	Brandt-Daroff exercises- stop the dizzy spells The Semont manoeuvre, or liberatory manoeuvre, is another exercise for BPPV. Epley manoeuvre is another popular exercise for vertigo.

**Table 6:** Surgical procedures for multiple indications

Benign paroxysmal positional vertigo	Singular neurectomy Posterior canal plugging
Ménière's disease and delayed endolymphatic hydrops	Saccotomy (Cody tack procedure) Cochleosacculotomy Labyrinthectomy
Endolymphatic sac surgery	Decompression Shunt with or without alloplastic tube
Labyrinthitis	Labyrinthectomy Vestibular neurectomy
Perilymphatic fistula	Fistula repair, sealing
Pontocerebellar pathology	Concomitant vestibular neurectomy
Neurovascular compression syndrome (vestibular paroxysm)	Decompression Vestibular neurectomy
Other diseases complicated by vertigo	Vestibular neurectomy Labyrinthectomy

## 5. Drugs for managing Vertigo

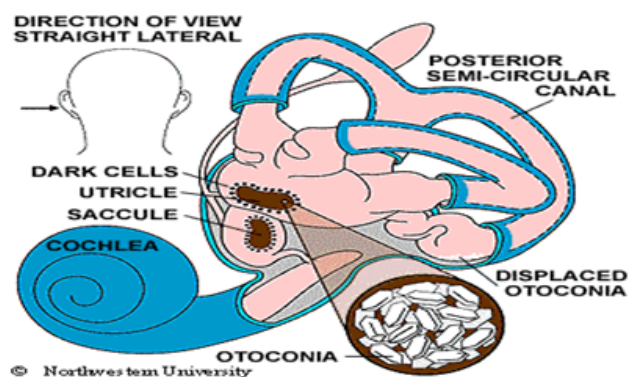
### 5.1. Calcium channel blockers

It is postulated that calcium channel blockers such as Amlodipine, Nifedipine inhibit the flow of calcium from the endolymph into the cells of the crista ampullaris, which is required for triggering an action potential that is propagated centrally

## 6. Cinnarizine

Is for the control of vestibular disorders such as vertigo, tinnitus, nausea and vomiting such as is seen in Meniere's Disease. Cinnarizine is also effective in the control of motion sickness. Cinnarizine is known to reduce the reaction to labyrinthine stimulation in normal subjects as well as to relieve symptoms in patients with vertigo. Cinnarizine is a polyvalent non-competitive antagonist of vasoconstrictive agents, and reduces the vascular response to epinephrine, norepinephrine, serotonin, angiotensin, dopamine, and other vasoactive hormones. Cinnarizine inhibits stimulation of the vestibular system, which results in suppression of nystagmus and other autonomic disturbances. Acute episodes of vertigo can be prevented or reduced by

cinnarizine.

**Fig. 1:** The semicircular canals

## 7. Cinnarazine and Flunarizine (CFNZ)

Dose is 25mg three times a day. The maximum recommended dosage should not exceed 225mg daily. CNS side effects include fatigue, drowsiness, dizziness, asthenia, headache, extrapyramidal symptoms such as tremor, rigor,

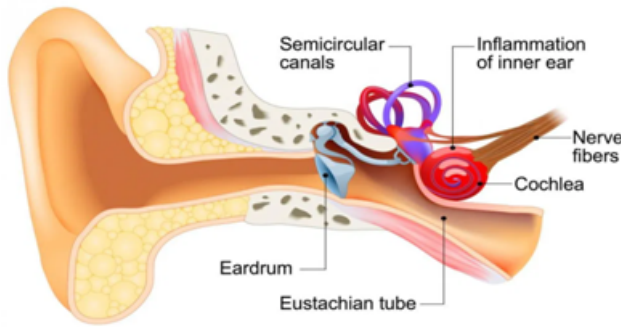


Fig. 2: Middle and internal Ear

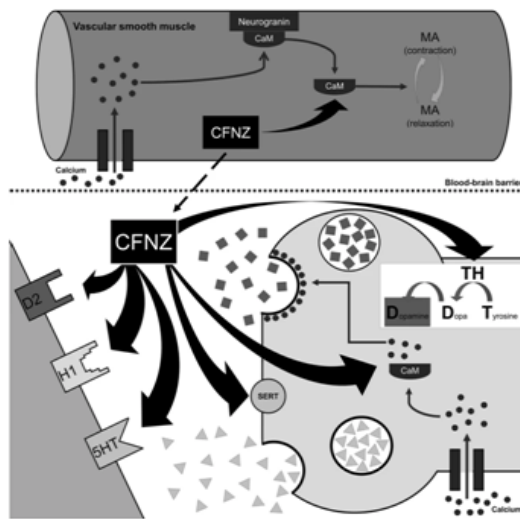


Fig. 3: Mode of action of cinnarazine and flunarizine

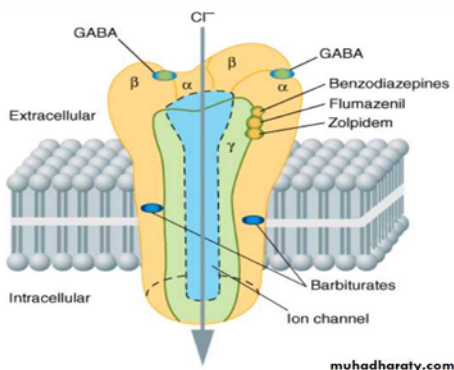


Fig. 4: Mode of action of benzodiazepines

and hypokinesia. cinnarizine is safe and effective in reducing both headache and vertigo aspects of “migraine plus vertigo” Cinnarizine treatment decreased the incidence of moderate vertigo episodes by 65.8% and decreased severe vertigo episodes by 89.8%.<sup>8</sup>

### 7.1. Flunarizine

Is a *selective calcium antagonist* with moderate other actions including antihistamine, serotonin receptor blocking and dopamine D2 blocking activity. It is a selective calcium entry blocker with calmodulin binding properties and histamine H1 blocking activity. It is effective in the prophylaxis of migraine, occlusive peripheral vascular disease, vertigo of central and peripheral origin. Flunarizine is well absorbed (>80%) from the gut and reaches maximal blood plasma concentrations after two to four hours, with more than 99% of the substance bound to plasma proteins. Common side effects include drowsiness (20% of patients), weight gain (10%), as well as extrapyramidal effects and depression in elderly patients. Flunarizine, either started with a loading dose gradually decreased thereafter, or given at a fixed 10 mg. dose schedule was proven to produce rapid improvement of dizziness and unsteadiness and to be tolerated very well.<sup>9</sup>

### 7.2. Nimodipine

Is a logical choice for use in the treatment of vertigo of peripheral origin, including Meniere’s disease and migraine associated vertigo. The calcium channel blockers used most commonly for the treatment of vestibular disorders are nimodipine, nitrendipine (a dihydropyridine with a long-lasting effect) and verapamil. Other long-term dihydropyridines such as amlodipine, felodipine, nicardipine and nifedipine are rarely used. Nimodipine has vasodilator, sedative vestibular and moderate anticholinergic effect, which in many cases of vertigo of peripheral origin. 30-mg nimodipine oral tablet taken three times per day.<sup>10</sup>

## 8. Benzodiazepines

### 8.1. Clonazepam, diazepam

These are GABA modulators Which presumably acts centrally to suppress vestibular responses. Low doses of diazepam (2mg) can also be quite effective. Addiction, sedation, impaired memory, increased risk of falling and impaired vestibular compensation are main side effects. Lorazepam, Clonazepam dose is 0.5 mg BID for the management of Vertigo.<sup>11</sup>

### 8.2. Antihistaminics

Promethazine cures peripheral vertigo more efficiently, Promethazine is an antagonist of histamine H1, post-

synaptic mesolimbic dopamine, alpha adrenergic, muscarinic, and NMDA receptors. In addition to its antihistaminic action, it provides clinically useful sedative and antiemetic effects. Promethazine is well absorbed from the gastrointestinal tract. Clinical effects are apparent within 20 minutes after oral administration and generally last four to six hours, although they may persist as long as 12 hours. The average adult dose is 25 mg taken twice daily. The initial dose should be taken one-half to one hour before anticipated travel and be repeated 8 to 12 hours later, if necessary.

Treatment of vestibular vertigo with betahistine (dosed at 48 mg/day) appears to be effective in reducing vertigo-associated symptoms in a routine outpatient clinical setting. If betahistine is used as a vestibular suppressant and only for symptomatic relief of vertigo, the duration should be limited to a maximum of 3 to 5 days. Betahistine is a strong H<sub>3</sub>-antagonist, facilitating histamine transmission, a weak H<sub>1</sub>- (calcium release) and H<sub>2</sub>- (production camp) agonist.

Betahistine has a prophylactic effect on Ménière's disease, and there is a limited effect during an attack.<sup>12,13</sup>

### 8.3. Anticholinergics

These are commonly used in motion sickness and other forms of vertigo. High density of muscarinic receptors is found in vagal nucleus, area postrema and vestibular nuclei. The central antimuscarinic action of these drugs is responsible for antivertigo effects. Scopolamine can be used with ephedrine (25 mg) to counteract sedation and to add the antivertigo effect. The side-effects were those described for scopolamine, such as blurred vision and dryness of the mouth. Scopolamine was not shown to be superior to antihistamines and combinations of scopolamine and ephedrine. Scopolamine was less likely to cause drowsiness, blurred vision or dizziness when compared to these other agents.<sup>14</sup>

## 9. Neuroleptics

Droperidol is one pharmaceutical agent which is remarkably effective in depressing inhibiting vestibular disturbance regardless of etiology. This medication (also called Inapsine) belongs to a relatively class of compounds known as butyrophenones and its pharmacological action can best be described as a dopamine blocking agent.

A single dose (droperidol 5 mg, fentanyl 0.1 mg) to patients undergoing acute episodes of vestibular disease (vestibular neuronitis and Ménière's disease) was found effective in the following symptoms and/or signs: nausea, vertigo, nystagmus, the positive past-pointing test and the Romberg test. Drowsiness is a common side effect of both droperidol and dimenhydrinate. Droperidol has also been associated with extrapyramidal side effects,<sup>15</sup>

## 10. Steroids

Oral prednisone helps to control refractory vertigo in Ménière's disease. The preliminary data suggests that prednisone can be a good noninvasive antivertigo management regimen for these patients. Steroids are commonly prescribed for sudden hearing loss as well as for autoimmune inner ear disease and vestibular neuritis. Dexamethasone is part of the management strategy for patients with Ménière's disease refractory to conventional treatment, implemented before destructive treatment. It achieves control of vertigo in 70% of patients at 2 years.<sup>16,17</sup>

## 11. Drugs with Probable Efficacy

### 11.1. Methotrexate

It showed improvement in bilateral meniere's disease in some prospective studies

## 12. Acetyl leucine

It is used mostly in France and is reported to have prompt antivertigo effect when given intravenously.

### 12.1. Trimetazidine

Showed better response in subset of Meiners disease in a dose of 60mg/day

## 13. Ginkgo biloba

Extract has uncertain utility in management of vertigo and meniere's disease although it is used in a dose of 40 mg thrice a day. A randomized, double-blind trial comparing efficacy and safety of Ginkgo biloba Extract EGb 761 and Betahistine were evaluated, the two drugs were similarly effective in the treatment of vertigo, but EGb 761 was better tolerated.

### 13.1. Ginger root extract

(*Zingibar officinale*) is used in nausea, vomiting and prevention of motion sickness but carefully controlled trials do not support its efficacy. Ginger root reduced the induced vertigo significantly better than did placebo. There was no statistically significant action upon the duration or the maximum slow phase velocity of nystagmus.<sup>18</sup>

## 14. Piracetam

Piracetam has been shown to be effective in vertigo of both central and peripheral origin. It is thought to act on vestibular and oculomotor nuclei in the brain stem a Additionally, piracetam potentiates the effects of sedative drugs and antihistamines. control of balance enhancing mechanisms of compensation and habituation. Additionally, piracetam potentiates the effects of sedative drugs and

antihistamines. The usual dosage of piracetam in vertigo is 2.4-4.8 g daily. Tolerability of piracetam is good and adverse effects have been mild and infrequent. The effectiveness of piracetam in the treatment of vertigo is thought to be the result of its effects on neurotransmission and micro circulation.<sup>19</sup>

## 15. Surgical Management of Peripheral Vertigo

### 15.1. Indications where surgical treatment for peripheral vertigo is warranted

Benign paroxysmal positional vertigo Idiopathic (Ménière's disease), secondary or delayed endolymphatic hydrops Recurrent vestibulopathy, Recurrent vestibular neuronitis, Labyrinthitis, Perilymphatic fistula Pontocerebellar, lesions (acoustic neuroma, arachnoid cyst or adhesion, other tumors) Neurovascular compression syndrome and Others (intractable vertigo due to other ear pathologies like syphilis or trauma).<sup>20</sup>

## 16. Conclusion

Vertigo is usually associated with a problem in the inner ear balance mechanisms (vestibular system), and Meniere's disease. Due to the numerous possible causes, patients with vertigo present a diagnostic challenge. Rehabilitation should be recommended in most patients in both peripheral and central balance disorders Appropriate treatment can significantly improve the quality of life in patients suffering from vertigo. Common drugs which are beneficial for treating vertigo are anticholinergics, antihistamines, benzodiazepines, calcium channel blockers and dopamine receptor antagonists.

## 17. Source of Funding

None.

## 18. Conflict of interest

None.

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