

Original article

The Study Of The Spectrum Of Vertigo With Special Reference To Vertigo Of Vascular Origin

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Abstract

Objectives: To outline the spectrum of vertigo, to elaborate the significance of vascular causes of vertigo, to advocate use of MRI / MRA of carotid artery and vertebral basilar arterial system in patients with isolated or syndromic vertigo especially when one or more risk factors for a cerebrovascular accident are present. **Study design:** Prospective study(2009-2011). **Results:** 91 patients who presented with vertigo were prospectively studied. BPPV, Meniere's disease and vestibular neuritis comprised about 60% of patients. Posterior circulation syndrome and vertebral basilar insufficiency was strongly suspected in 13 patients (14.3%). Compression of 8th nerve and cerebellar vermis were documented to be the cause of vertigo in 7 patients (7.7%), cervical vertigo was seen in 6(6.6%) patients. 4 patients (4.4%) had vertigo as a manifestation of complicated CSOM. 3 (3.3%) patients had metabolic vascular syndrome out of which one patient died of stroke about 6 months after his presentation as recurrent episodic vertigo. No diagnosis could be made in 3 patients. **Conclusion:** A detailed history should be obtained and an elaborate vestibular and neuro-otologic examination done in a patient of vertigo. A diagnosis can be reached in more than 90% of patients. Peripheral vertigo is more common than central vertigo with BPPV, meniere's disease and acute vestibular neuritis accounting for more than 60% of all cases of vertigo. Vascular causes form a significant group of vertigo patients. Vertigo especially recurrent and syndromic with 1 or more risk factors should not be overlooked and should be regarded a precursor of a future stroke. Patients of vertigo with vascular risk factors like age (elderly), hypertension, smoking, diabetes mellitus, hyperlipidemia and cardiac disease should be evaluated for vertebral basilar insufficiency by specific investigations like MRI brain, MRA carotids and vertebral basilar arteries, Doppler USG and risk factors for vascular disease modified by drugs (hypolipidemic, antihypertensive, aspirin) and behavioural changes. Abnormal vessel loops can compress VIII nerve and cause vertigo. These can be reliably diagnosed by MRA. Vertigo can be caused in patients with cervical spondylosis especially in previously diseased vessels (due to atherosclerosis, vasculitis) which get easily compressed by cervical osteophytes.

Introduction

The overwhelming vertigo, the awful sickness and the turbulent eye movements all enhanced by slightest movements of the head, combine to form a picture of helpless misery that has few parallels in the whole field of injury and disease. Vertigo still remains less understood entity and still puzzles many clinicians. **Definition:** Vertigo is the illusion of movement of the body or the environment. Vertigo is defined by the new oxford dictionary of English "as a sensation of whirling and loss of balance, associated particularly with looking down from a great height, or caused by disease affecting the inner ear or the vestibular nerve; giddiness." Patients, therefore, also use the term vertigo, gid-

diness and dizziness interchangeably and differentiation between these words has become somewhat blurred. The American Academy of Otolaryngology and Head & Neck Surgery Committee on hearing and equilibrium guidelines define vertigo as 'the sensation of motion when no motion is occurring relative to the earth's gravity' in contrast to motion intolerance which is a feeling of disequilibrium, spatial disorientation or malaise during active or passive movement. **Problem Statement:** Vertigo is a common symptom especially in the elderly. By the age of 65, one third of population has suffered symptoms of imbalance and in the community one in five of the adult population have suffered such symptoms with 30% of

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these symptoms for more than four years. Of all, benign paroxysmal positional vertigo is thought to be the most common cause and forms about 25% of all vertigo patients who present at health institutions². Vertigo of vascular origin appears to be more common in the elderly above 50 years of age. Despite the obvious public health significance, these patients typically have great difficulty accessing good quality healthcare and are generally perceived by otolaryngologists to represent one of the most frustrating and frustrated group of patients. However, a diagnosis can be made in the majority of cases from a focused history and examination with selective adjunctive use of MRI, MRA etc. **Pathophysiology of Vertigo:** Human beings have a complex mechanism for maintaining balance; including visual, proprioceptive and vestibular inputs, which are integrated within the CNS

and modulated by the cerebellum, the extrapyramidal system, the reticular formation and the cortex. This integrated modulated activity provides the means of controlling oculomotor function, posture, gait and motor skills in addition to allowing the perception of head and body position in space. A mismatch of information from any of these organs causes vertigo³.

Causes: The disorders giving rise to vertigo can be broadly categorized into two main groups:

Peripheral Vertigo: Wherein the cause lies in the internal ear or eighth nerve i.e. upto 1st order neurons.

Central Vertigo: Wherein the cause lies in the CNS after the entrance of vestibular nerve in the brainstem and involves vestibulo-ocular, vestibulo-spinal and other CNS pathways.

Differentiating Peripheral from Central Vertigo

	Peripheral	Central
Onset	Sudden	Sudden or slow
Severity of vertigo	Intense spinning	Ill defined, less intense
Pattern	Paroxysmal, intermittent	Usually constant
Aggravated by position/movements	Yes	Variable
Associated with nausea	Frequent	Variable
Nystagmus	Rotatory, vertical, horizontal	Vertical
Fatigue of symptoms	Yes	No
Hearing loss / Tinnitus	May occur	Usually does not occur
Abnormal tympanic membrane	May occur	Does not occur
CNS symptoms / signs	Absent	Usually present

I. Peripheral Causes

1. Meniere's disease⁴
2. Benign paroxysmal positional vertigo⁵
3. Vestibular neuronitis⁶
4. Labyrinthitis
5. Perilymph fistula⁷
6. Head trauma / ear surgery^{8,9}
7. Superior semicircular canal dehiscence¹⁰
8. Vestibulotoxic drugs like aminoglycosides, antimalarials, diuretics etc.
9. Acoustic neuroma
10. Syphilis
11. Inner ear dysplasia¹¹

II. Central Causes

1. Vertebrobasilar insufficiency and posterior circulation stroke¹²

2. Posterior inferior cerebellar artery syndrome¹³
3. Basilar migraine^{14,15}
4. Cerebellar disease: Haemorrhage, degeneration¹⁶
5. Multiple sclerosis
6. Tumours of brainstem and fourth ventricle¹⁷
7. Epilepsy
8. Cervical vertigo¹⁸

Vascular causes form a predominant factor in the central group and also have a significant role in the peripheral group.

Vertigo can be classified in different ways, but the most common classification is the clinical topographic classification described above that divides it into central and peripheral vertigo, in an attempt to distinguish between neurological and otological problems. Although we are aware that there are

diseases with possible central and peripheral involvement (infectious, autoimmune, vascular, metabolic diseases, etc) where the lesion's topography is not easy to determine.

Materials and Methods:

This study has been conducted in the Department of Otorhinolaryngology, Head and Neck Surgery, Government Medical College and associated SMHS Hospital, Srinagar. The study has prospective and retrospective components. Retrospective study has been conducted on 92 stroke patients admitted in this hospital (2009-2011) enquiring about various risk factors for stroke and any history of vertigo in past or at the onset of stroke. In the prospective study, 91 patients with vertigo as the chief complaint who visited our department have been evaluated. Patients with vertigo of suspected vascular origin (due to the presence of vascular risk factors) have been evaluated for the same.

Inclusion and Exclusion Criteria

Only patients with true vertigo with a sense of rotation of self or of the surroundings have been included in this study and patients with dizziness or syncopal attacks have mostly been excluded.

Clinical data from the patients included:

Detailed history of the patient

General physical examination

Neurological examination including cranial nerves

Otolaryngological examination of the patient

Vestibular assessment of the patient

Routine haematological, biochemical and relevant investigations.

Audiometric evaluation of the patients.

Radiological evaluation of patient including X-ray cervical spine, HRCT temporal bone, CT brain, transcranial Doppler (carotids and vertebral arteries), MRI and MRA as per need felt.

Follow up and Review

Most of the patients were followed up for about two months to two years to study the effect of remedial measures, development of recurrence or appearance of new signs and symptoms.

This protocol was approved by ethical committee of the Government Medical College and associated SMHS Hospital, Srinagar.

OBSERVATION AND RESULTS:

In this study 91 vertigo patients were studied prospectively and 92 stroke patients were studied retrospectively.

Prospective Study

In the prospective study, 91 vertigo patients were evaluated and a provisional diagnosis of the underlying cause of vertigo made based on history, examination and different biochemical and radiological investigations. The relevant data is summarized and tabled as under:

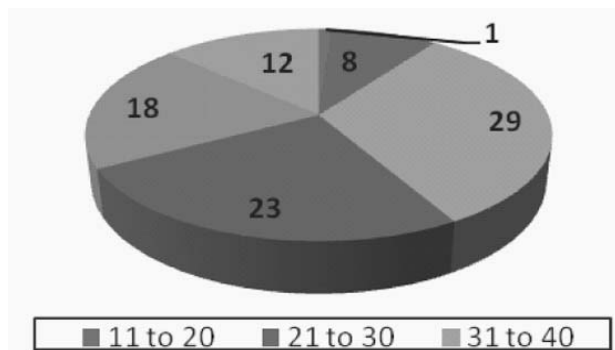
Table I: Patients Studied

Total number of patients	91	
Male to Female Ratio	52 (58%)	39 (42%)
Rural to Urban Ratio	37 (40.6%)	54 (59.4%)

The above table shows higher number of vertigo patients to be males and more patients residing in urban areas.

Table - II: Age Distribution of Patients

Age (Years)	No. of Patients	Percentage
11 to 20	1	1.1
21 to 30	8	8.8
31 to 40	29	31.9
41 to 50	23	25.3
51 to 60	18	19.8
61 to 70	12	13.1



Above table and graph shows that about 77% of patients were in the age group of 30-60 years with only 1 patient having vertigo in the 0-20 age group in this study.

Table - III: Symptoms

Symptoms	No. of Patients	Percentage
Isolated vertigo	29	31.9
Hearing loss	36	39.6
Tinnitus	27	29.7
Aural fullness	11	12.1
Ear discharge	9	9.9
Nausea	18	19.8
Vomiting	32	35.2
Chronic headache	11	12.1
Cervical problems (neck pain)	17	18.7

Table shows that about 42% of the patients had experienced vertigo episodes for a long duration of time (months to years) and about 22% of the patients had vertigo episodes lasting several minutes which is the typical duration of vertigo due to a vascular cause.

Table -IV: Vertigo parameters in the studied subjects

Symptoms		No. of Patients	Percentage
Overall duration of Vertigo	Days	52	57.1
	Months	22	24.2
	Years	17	18.7
Periodicity of Vertigo	Recurrent	31	34.1
	Continuous	24	26.4
	Intermittent	36	39.5
Duration of Episodes of Vertigo	Seconds	38	41.7
	Minutes	20	22.0
	Hours	14	15.4
	Days	19	20.9
Character of Vertigo	Spontaneous	50	55.0
	Induced	41	45.0
	Induced by head movements	40	44.0
	Induced by pressure	1	1.0
	Induced by loud noise	0	0.0

Table shows isolated vertigo to be fairly common in this study present in about 32% of the patients. Most common associated symptoms in this study were hearing loss (40%), vomiting (35%) and tinnitus (30%)

Table -V: Signs

Signs	No. of Patients	Percentage
Positive Dix Hallpike's test	23	25.3
Nystagmus	19	20.9
Cerebellar signs (Ataxia, Dysmetria)	8	8.8
Motor weakness	2	2.2
Facial palsy	1	1.1

Table shows Dix Hallpike's test positive in 25% of patients and cerebellar signs present in about 9% of patients. Therefore a complete examination is necessary in vertigo patients to reach at a diagnosis.

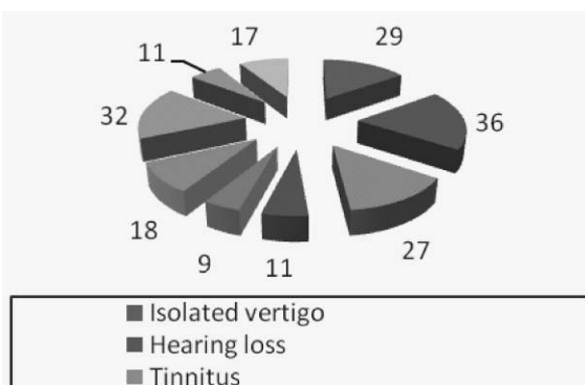


Table - VI: Caloric Testing(n=19)

Testing	No. of Patients	Percentage
Normal response	11	58
Hypoactive	6	31
Hyperactive	2	11

Table shows hypoactive labyrinth in 6 patients (31%) out of 19 patients tested in this study.

Table -VII: CT Findings in the Studied Subjects (n=23)

CT Findings	No. of Patients	Percentage
Cholesteatoma with bone erosion	4	17.39
Posterior circulation territory infarct	1	4.34
Widening of internal auditory canal	1	4.34
Microvascular ischemic changes in brain	1	4.34
Normal Study	16	69.56

Table shows abnormal CT findings in 7 patients out of 23 patients in which CT was ordered (30.4%) with one patient having a frank infarct not suspected on initial history and examination. Other patient was having widening of IAC and was diagnosed as vestibular schwannoma on MRI.

Table -VIII: Doppler Carotids and VBA(n=10)

Findings	No. of Patients	Percentage
Atheromatous plaques in vertebral artery / carotid artery	3	30.0
Increased intimal thickening with turbulent flow	1	10.0
Normal Study	6	60.0
Total	10	100

Table shows atheromatous plaques and intimal thickening in 4 out of 10 patients of vertigo in whom Doppler study was ordered in this study.

Table -IX: MRI Findings (n=15)

Findings	No. of Patients	Percentage
Microvascular ischaemic changes in brain	2	13.33
Vestibular schwannoma	2	13.33
Cerebellar cysts	1	6.66
Vascular loop	1	6.66
Perimesencephalic lipoma	1	6.66
Normal Study	8	53.33

Table shows 7 patients having vertigo due to ischaemia and compression of 8th nerve and its central connections diagnosed on MRI in this study.

Table -X: Provisional Diagnosis

Provisional Diagnosis	No. of Patients	Percentage
Benign paroxysmal positional vertigo (BPPV)	23	25.3
Meniere s disease	21	23.1
Acute vestibular neuritis	11	12.1
Posterior circulation syndrome and vertebrobasilar insufficiency	13	14.2
VIIIth nerve compression syndromes	7	7.7
Cervical vertigo	6	6.6
Metabolic/vascular syndrome	3	3.3
Labyrinthitis	3	3.3
Lateral semicircular canal erosion	1	1.1
Unknown cause	3	3.3

Table shows BPPV to be the most common cause of vertigo. Vascular causes appear to be etiology of vertigo in 25% of patients in this study including posterior circulation syndrome and VBI (14.2%), cervical vertigo (6.6%), metabolic vascular syndrome (3.3%), dolichoectasia of basilar artery (1%). One of the patients grouped under metabolic vascular syndrome died of stroke about 6 months after his initial presentation as vertigo.

Table-XI: Treatments

Treatment	No. of Patients	Percentage
Medical	80	87.9
Surgical	5	5.5
Referred to Neurosurgery	6	6.6

SUMMARY AND CONCLUSION: Based on the observations of this study and the review of the literature we conclude as under:

A detailed history should be obtained and an elaborate vestibular and neuro-otologic examination done in a patient of vertigo. A diagnosis can be reached at in more than 90% of the patients.

Peripheral vertigo is more common than central vertigo with BPPV, meniere's disease and acute vestibular neuritis alone accounting for more than 60% of all cases of vertigo.

Vascular causes form a significant group of vertigo patients .

Vertigo especially recurrent and syndromic with 1 or more vascular risk factors should not be overlooked and should be regarded a precursor of a future stroke.

Patients of vertigo with vascular risk factors like

age (elderly), hypertension, smoking, diabetes mellitus, hyperlipidemia and cardiac disease should be evaluated for vertebrobasilar insufficiency by specific investigations like MRI brain, MRA carotids and vertebrobasilar arteries, Doppler USG and risk factors for vascular disease modified by drugs (hypolipidemic drugs, antihypertensives, aspirin) and behavioural changes and dietary modifications. These patients are actually at risk for a future stroke.

Abnormal vessel loops can compress VIII nerve and cause vertigo. These can be reliably diagnosed by MRI/MRA.

Vertigo can be caused in patients with cervical spondylosis especially in previously diseased vessels (due to atherosclerosis, vasculitis) which can get easily compressed by cervical osteophytes.

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