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Original Research Article

A STUDY ON VERTIGO - EVALUATION OF BEDSIDE TESTS AND AETIOPATHOLOGY

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Abstract

Background: Spatial orientation is largely automatic but complex. Normally the brain integrates the input from sensory modalities that enables us to maintain balance, move about, and interact with other objects. Vertigo is defined as the 'hallucination' of movement, either of self (subjective) or the environment (objective). Diagnosis of the underlying disease demands that the complaint of vertigo be analyzed correctly, the nature of the disturbance of function being determined first and then its anatomic localization. A careful history and physical examination usually affords the basis for separating true vertigo from the dizziness of the anxious patient and from the other types of pseudo vertigo. This study evaluates the vertigo patients based on history, examination and relevant investigations to establish the etiology for the vertigo. **Materials and Methods:** A total of 110 patients attending the Neurology OPD at Rajiv Gandhi Government Hospital with vertigo were analysed in this study. All these patients were evaluated using the bed side tests like head thrust test, dynamic visual acuity test, head shaking test, Dick Hallpike test, Fukuda test after through history, clinical and laboratory investigations. **Result:** Total number of vertigo patients- 110. 39 patients (35.4%) 31 to 40 years of age was the most common age group affected in the study.Total number of male patients 84 (76.3%). Total number of female patients 26(23.6%). BPPV was the commonest peripheral cause of vertigo 19 (17.2%). Migranous Vertigo was the commonest central cause of Vertigo 10(9%). Diabetes mellitus was the commonest systemic cause of vertigo.9(8.1%). Overall BPPV was the commonest cause 19 (17.2%) in this study. Vestibular neuonitis 16 (14.5%) was the second common cause of vertigo. 6(5.4%) patients had vertebro basilar insufficiency. 5(4.5%) patients had posterior circulation stroke. Among the bedside test head thrust test was most significant, and 38(34.5%) patients showed positive results with head thrust test. Dick Halpick's, Calorie test positive only in peripheral vertigo. CT brain showed lateral medullary infarct in 4 patients and acoustic neuroma in 2 patients. MRI brain showed lateral medullary infarct in 5 patients and acoustic neuroma in 2 patients. **Conclusion:** Benign paroxysmal positional vertigo (BPPV) was the commonest cause of vertigo in this study. 31 to 40 years had the highest incidence of vertigo in this study. Migranous vertigo was the common central cause of vertigo. Head thrust test was the most reliable bedside test. Dick Halpick's and calorie test positive only in peripheral vertigo. All the bedside tests used in this study were very much significant for vertigo.

INTRODUCTION

Vertigo is defined as the 'hallucination' of movement, either of self (subjective) or the environment (objective).[1-5] Usually the patient uses various terms (eg.) Bouncing, Oscillating, Staggering. Swimming. Twisting Rolling, Spinning, Rocking, Lightheadness, Imbalance, Floating, Fainting, Falling.[1] For the most part they are benign but always there is the possibility that they signal the presence of an important neurological disorder.[2,6-8] Diagnosis of the underlying disease demands that the complaint of vertigo be analyzed correctly, the nature of the disturbance of function being determined first and then its anatomic localization.[2] A careful history and physical examination usually affords the basis for separating true vertigo from the dizziness of the anxious patient and from the other types of pseudo vertigo.[2] This study evaluates the vertigo patients based on history, examination and relevant

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investigations to establish the etiology for the vertigo.[9-12]

Objective of the Study

- To evaluate the bedside tests used in vertigo
- Find out the cause for vertigo by using history, bed side examination and investigations.

MATERIALS AND METHODS

The study is a prospective study conducted at Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai. It was conducted during the period October 2004 to April 2007. Study population were the patients who attend the out patient department of Institute of Neurology, RGGGH,MMC, Chennai. Inclusion Criteria was Patients who attend the neurology OPD with chief complaint of Vertigo.Exclusion Criteria were known case of head injury with vertigo, known cardiac patients with vertigo,known case of seizures with vertigo. Sample size was calculated and a total of 110 patients were planned for the conduct of this study.

Methods: All the patients were subjected to a thorough history, clinical examination and various bed side tests like Head thrust test, Dynamic visual acuity, Head shaking test, Dix Hall pick's test, Fukuda's test and Calorie test and investigations like CT/MRI brain, X-Ray neck, Blood sugar, Lipid profile, Carotid vertebral Doppler. The Head Thrust test: Method: the patients's head is held firmly on each side and the patient is asked to fixate on any one point say the examiner's nose. The head is moved slowly from side to side to see if the eyes are remaining fixed on one point (the examiner's nose). Once the examiner is satisfied that the patient is following the instructions, the head is rapidly brought back into the midline. If the VOR is normal, the eyes do not move at all. If there is vestibular imbalance, the VOR on the affected side is hypoactive and the eyes move with the head. When the head is brought back to the midline, there is a re-fixation saccade. The examiner carefully looks for this re-fixation movement of the eyes. This saccadic re-fixation only occurs after rotation of the head to the affected side and persists for a very long time. The Head Thrust test is very reliable for unilateral vestibular hypo function.[13]

Dynamic Visual Acuity: Method: Ask the patient to read the smallest line possible on a Snellen's eye chart with best corrected vision. Repeat the visual acuity (VA) while passively shaking the patient's head at 2Hz. Record the number of lines "lost" during the head shake. If the VOR is normal, the eyes remain fixed on the target line and the visual acuity does not change. If the VOR is hypoactive, the eyes move with the head and are no longer fixed on the target line, resulting in visual degradation. Loss of three or more lines from static VA indicates vestibular dysfunction and is a good test for vestibular hypofunction due to ototoxicity or age.[14]

The Head Shaking test: Method: The patients head is pitched down 30' and oscillated at 2 Hz for 20 seconds. An abnormal test is elicitation of jerk nystagmus. Post head shake nystagmus is considered pathologic of vestibular imbalance. In most cases a peripheral is identifies with the fast phase beating towards the unaffected (stronger) ear.[3] The Dick-Hallpike test is a manoeuvre which is specifically positive if a patient has benign paroxysmal positional vertigo (BPPV). It is intended to stimulate the vertical SCC. The anterior and contralateral posterior SCCs are approximately parallel in a plane orientated 45' from the sagittal plane. With the head turned 45' to one side, moving patient from sitting to supine results in rotation in the plane of the canal pair, ie. In the horizontal plane. In the normal patient, nystagmus occurs during the manoeuvre but not after it. In BPPV, a change of position causes movement of the endolmph elicitin g vertigo. The nystagmus starts at a latency of 4-10 secs and lasts upto 30secs. Involvement of the posterior SCC results in up-beating nystagmus with a rotary component, the upper pole of the eye beating towards the lower ear. BPPV results from debris moving freely in the vertical SCCs, usually the posterior.[3] Fukuda test (Stepping Test of Underberger) The patient to march in place with eyes closed and arms outstretched normally less than 15 Degrees or so of rotation is displayed Asymmetry of labyrinthine function is manifest as excessive rotation away from the diseased side.[4] Calorie test: The patients head ideally tilted forward 30 degrees from the horizontal, each auditory canal is irrigated for 30 seconds, first with water of 30° C, and then at 44 C with a pause of at least 5 minutes between each irrigation. In normal persons cold water induces a slight tonic deviation of the eyes to the side being irrigated, followed after a latent period of 20 seconds by nystagmus to the opposite side (direction of fast phase). Warm water induces nystagmus to the irrigated side.[2] Caloric testing will reliably answer whether the vestibular end organs react and comparison of the responses from the two ears will give which one is paretic.[2]

Nystagmus: The presence of spontaneous or induced nystagmus is of crucial importance in making a diagnosis of peripheral or central causes of imbalance.[3] Spontaneous nystagmus of a peripheral origin is usually due to lesions either of the labyrinth or eighth cranial nerve.

The characteristics of nystagmus of a peripheral origin are as follows: (3) a) Mixed-horizontal plus rotational/tortional. b) Presence of fixation suppression if there is a gaze evoked nystamus while the patient is staring at a blank wall, asking the patient to fixate on your finger, suppresses the nystagmus i.e. the nystagmus is so-to-say "fatiguable" c) The nystagmus is intense, i.e. it intensifies (increases in amplitude) in the direction of the fast phase, d) It is direction fixed i.e. it does not change direction with gaze. Usually in an irritative lesion, it is in the direction of the affected ear and beats towards the unaffected ear if the lesion is destructive.

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Spontaneous nystagmus of central origin is usually due to lesions of the brainstem, cerebellum or rarely certain areas of the cerebrum. The characteristics of nystagmus of central origin are quite the opposite of peripheral nystagmus (3). Thus the characteristics of central nystagmus are: a) pure purely horizontal, vertical or torsional, b) absence of fixation-suppression over the examiner's finger, it is "non-fatiguable" when one fixates c) less intense does not intensify in amplitude in the direction of fast gaze, d) direction changing with gaze left beating nystagmus with left gaze. Nystagmus is dampened by convergence, therefore, do not hold the finger very close to the eyes hold it at least 14 inches away. Primary position nystagmus is suppressed by fixation. The maneuvers to suppress fixation are to ask the patient to stare at a totally blank wall, the hand held ophthalmoscope methods.

RESULTS

In the Total 110 Cases 75 cases found to have Peripheral Causes and 21 cases have Central Causes. Only 14 cases were identified to be associated with Systemic Causes.

Table 1: Age Distribution of the study population.

Age	No of Cases	Percentage
11-20	7	6.3
21-30	20	18.1
31-40	39	35.4
41-50	23	20.9
51-60	13	11.8
61-70	5	4.5
71-80	3	2.7

35.34% of the patients were in the age group of 31 – 40 - Peak Incidence.
2.7% of the patients were in the age group of 71 - 80- Low Incidence.
In this study the highest incidence is found in 4th decade 39 (35.4%) cases followed by 5th decade 23 (20.9%) cases then 3rd emptyset decade 20 (18.1%) cases.
Men appear to be affected more than Women. Men 84 (76.3%) Women 26 (23.6%).

Table 2: Sex Distribution

Sex	No of Cases	Percentage
Male	84	76.3
Female	26	23.6
Total	110	100

Table 3: Peripheral Causes

S.no	Causes	No of Cases			Percentage
		Male	Female	Total	
1.	CSOM	10	4	14	12.7
2.	Post Operative After Tympano mastoid, Tapes Surgery	4	2	6	5.4
3.	BPPV	16	3	19	17.2
4.	Meniere's Disease	8	3	11	10
5.	Labrinthitis	6	1	7	6.3
6.	Acoustic Neuroma	1	1	2	1.8
7.	Vestibular Neuronitis	14	2	16	14.5

Out of the 75 cases diagnosed with peripheral causes BPPV has the highest incidence - 17.2% followed by Vestibular Neuronitis - 14.5%.

Table 4: Central Causes

SI.NO	Causes	No of Cases			Percentage
		Male	Female	Total	
1.	Migrainous Vertigo	4	6	10	9
2.	Vertebro Basilar Insufficiency (VBI)	5	1	6	5.4
3.	Posterior circulation Stroke	5	0	5	4.5

Migranious vertigo has the highest incidence of - 9% Followed By Vertebro basilar insufficiency (vbi) - 5.4%. Age wise vbi has significant 'p' value 0.001. Sex wise migranous vertigo has significant 'p' value 0.005.

Table 5: Systemic Causes

SI.NO	Causes	No of Cases			Percentage
		Male	Female	Total	
1.	HYPOTHYROIDISM	2	1	3	2.7
2.	DIABETES MELLITUS	7	2	9	8.1
3.	DRUGS-ANTI HYPERTENSIVE	1	0	1	0.9
4.	ANAEMIA	1	0	1	0.9

Diabetes Mellitus has the Highest Incidence of - 8.1%

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Table 6: bed side tests for vertigo

Bed sides tests	Male	Female	Total
NYSTAGMUS	38	9	47
FUKUDA'S	28	7	35
DICK'S HALLPICK'S	16	3	19
HEAD THRUST	30	8	38
DYNAMIC VISUAL ACUITY	29	5	34
HEAD SHAKING TEST	24	6	30
CALORIE TEST	28	6	34

'P' value for nystagmus 0.127 (not significant), 'P' value for all bedside tests 0.001 which is highly significant.

Table 7: Imaging in vertigo patient

S.no	Investigation	Male	Female	Total
1.	CT Brain	5	1	6
2.	MRI Brain	6	1	7
3.	Carotid Vertebral Doppler	10	1	11

DISCUSSION

Vertigo is often an untreated symptom and is frequently associated with serious handicap and considerable psychological morbidity. The exact cause often remains elusive.[15-18] Usually it begins in the fourth decade and attains its highest prevalence in the sixth decade (McNally and Stuart 1949; Nsamba C 1972: Ponniah RD 1977, Bhatia and Deka 1985).[19-22] Vertigo disorders of peripheral origin are more commonly found in 3 ^ prime prime and 4 ^ m decade of life. The disease is less common above 50 years and is rare below 20 years of age. This study corroborates with the findings of Deka (1985 and Debasish Burman).[23] In this study the highest incidence is found in 4th decade 39 (35.4%) cases followed by 5th decade 23 (20.9%) cases then 3rd commonest decade 20 (18.1%) cases.

Men appear to be affected more than Women. Men 84 (76.3%) Women 26 (23.6%). Kasarkas (1994) in a study on dizziness in the elderly reported a prevalence of in women as compared to 37% in men,[24] In another population based study on incidence of begin paroxysmal positional vertigo, 64% of affected ents were women (Froehling and Silverstein 1991).[25] According to Deka (1985), the male and the female ratio of peripheral vertigo 3:2, le Gopal G. S (1991) showed the ratio as 4:1.[26-28] Debasish Burman study males are five folds more affected than females.

BPPV appears to be the commonest disorder (17.2%). Debasish Burman 20% Montadon 1984, (27) 28%; Deka et al 1985, 17%). Its frequency is probably greater than indicated, because the physicians tend to refer these cases less, being aware of its specificity and food prognosis. Post operative vertigo found in 6 (5.4%) cases Debasish Burman 7 cases out of 95 cases. Meniere's disease which is supposed to be the commonest peripheral vestibular sorder (Mawson and Ludman 1979),[28] is less commonly seen in this study 11 (10%) cases. This figure is almost same as studied by Deka (1985) and Debasish Burman (10.5%). The diagnosis presents problems and various centers have their own parameter to diagnose this condition. We diagnosed them on the basis of Diagnostic criteria of Meniere's Disease. Labyrinthitis composed of 7 (6.3%) of all patients and vertigo was the predominant complaint in all cases. According to Debasish Burman labyrinthitis was 7.4% of all cases. Midle ear lesions (CSOM, Post-operative cases) comprised of 20 (18.1%) cases In this study. In Debasish Burman study this was 25.2%. It can not be overemphasized that in any vertiginous patient, middle ear disease must be excluded before other avenues of investigations are pursued.

Systemic disorder masquerading as peripheral vertigo is not uncommon. In this study diabetes mellitus 9 (8.1%) cases form the majority. Other findings are hypothyroidism 3 (2.7%) cases. Anti-hypertensive induced 1 (0.9%) case. Anaemia induced 1 (0.9%) case. Acoustic neuroma accounts for about 2 (1.8%) patients as compared to Montadon (1984) 4% and Deka (1985) 10%, Debasish Burman (13.6%). In this study migranous vertigo in 10 (9%) patients. Vertebro basilar insufficiency 4/54%) and posterior circulation stroke 5 (4.5%). In a study by Kathleen A. Delaney cerebrovascular disease accounted for 19% of dagnosed causes of vertigo.[29] in one unselected series of 82 patients with migraine headaches, 44 (54%) reported vertigo that was either part of the aura (11/44), accompanied the headache (10/44), or followed the headache (2/44). Other neuro-otologic signs such as initus and hearing loss, occurred in 15 of 44 and 13 of 44, respectively, Neuhauser H study showed the prevalence of migranous vertigo was 7% in the azziness clinic group, and 9% in the migraine clinic group.[15] Nineteen percent of patients with vertebrobasilar insufficiency report at least one episode of isolated vertigo occurring from 1.5 years to two days before the development of multiple symptoms.

In this study vertigo of less than 1 min duration occurs in 23 patients and more than 24 hours occurs in 25 patients. Ronald H. Labuguen showed vertigo of several seconds to a few minutes occurs in Benign paroxysmal positional vertigo; vertigo of Days occurs in Early acute vestibular neuronitis, stroke: migraine.[32] In a study by Michael Vonbravern in migranous vertigo in 2005 showed out of 20 patients, 6 patients showed duration of less than 6 hours, 8

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patients showed duration of 24 hours to 1 week, 4 patients showed duration of more than 1 week

In this study hearing impairment occurs in 40 patients, tinnitus occurs in 30 patients, aural fullness occurs in 11 patients, dysphagia and dysarthria occurs in 9 patients. Study by Kathleen A. Delaney showed hearing loss 14%, tinnitus 10%, dysphagia 10%.

In this study CT brain showed lateral medullary infarct in 4 patients. MRI brain showed lateral medullar infarct in 5 patients. In a study by A Barth PICA infarct manifested as acute vertigo. Total No of study patients 34. 16 patients had PICA infarct and all the 16 patients had vertigo.[31] While doing fukuda's test 9 patients moving forward 3-4 steps instead of turning to one side. All the 19 cases of BPPV fulfill all the 4 diagnostic criteria for BPPV and Dick Hallpick's test was positive in all the 19 BPPV patients.

Among the 10 patients of Migranous vertigo 8 patients fulfill the criteria for definite Migranous vertigo 2 patients were probable Migranous vertigo. Inthis study the bedside tests were not useful to identify Migranous vertigo.

Nystagmus was presented 47 patients out of this 36 patients had features of penpheral nystagmus, 11 patients had features of central nystagmus. The Bedside tests used in this study were very much useful for vertigo with the significant 'P' value of < 0.001. Various bedside tests applied in this study among these most of the tests positive in both central and peripheral vertigo. Two tests (Calorie, Dick Hall pick's) were specific for peripheral vertigo.

Head thrust test is the most significant test in this study in this 46.66% positive for peripheral vertigo and 14.28% positive for central vertigo, so more than half (53.34%) of peripheral vertigo cases it is negative.

Calorie tests positive only in peripheral vertigo (45.33%) but in more than half 54.77%) of patients of peripheral vertigo cases it is negative. Even though calorie test is specific for peripheral vertigo the absence of this test will not exclude the peripheral vertigo.

Dick Hal pick's test is very specific for BPPV (100% positive) and it is not positive in central cases. Dynamic visual acuity is positive in 41.33% of peripheral cases and 14.28% of central cases of vertigo. Fukuda's test is positive in 44% of peripheral cases and 9.52% of central cases of vertigo. Head shaking test is positive in 36% of peripheral cases and 14.28% of central cases of vertigo.

An analysis of the various bedside tests employed in the assessment of vertigo revealed that most often the tests are positive in patients with peripheral causes rather than central. All the tests were not positive in a given patient but at least one of these tests was abnormal in patients with a peripheral vertigo. In patients in whom the test was positive with suspected central cause, all of them had posterior circulation stroke which could have involved the peripheral apparatus as well. Those with peripheral causes in whom bedside tests were positive, a pattern or correlation of a test with a particular Aetiopathology was observed. The Dick Halpike's test was positive in all patients with BPPV and was found to be specific for this condition and not seen with other peripheral or central causes. The Calorie test was positive in patients with peripheral causes of vertigo only but was positive in only less than half of the number of patients, mostly in patients with labrynthine (45.5%) or vestibular nerve involvement.

Summary

Total number of vertigo patients- 110. 39 patients (35.4%) 31 to 40 years of age was the most common age group affected in the study. Total number of male patients 84 (76.3%). Total number of female patients 26(23.6%). BPPV was the commonest peripheral cause of vertigo 19 (17.2%). Migranous Vertigo was the commonest central cause of Vertigo 10(9%). Diabetes mellitus was the commonest systemic cause of vertigo.9(8.1%). Overall BPPV was the commonest cause 19 (17.2%) in this study. Vestibular neuronitis 16 (14.5%) was the second common cause of vertigo. 6(5.4%) patients had vertebro basilar insufficiency. 5(4.5%) patients had posterior circulation stroke. 47 patients had nystagmus. Among the bedside test head thrust test was most significant, and 38 patients showed positive results with head thrust test. Dick Halpick's, Calorie test positive only in peripheral vertigo. CT brain showed lateral medullary infarct in 4 patients and acoustic neuroma in 2 patients. MRI brain showed lateral medullary infarct in 5 patients and acoustic neuroma in 2 patients. Vertigo duration of less than 1 min occurs in 23 patients more than 24 hours occurs in 25 patients. Vertigo associated with hearing important in 40 patients. Tinnitus in 30 patients dysphagia and dysarthria in 9 patients.

CONCLUSION

Benign paroxysmal positional vertigo (BPPV) was the commonest cause of vertigo in this study. 31 to 40 years had the highest incidence of vertigo in this study. Migranous vertigo was the common central cause of vertigo. Head thrust test was the most reliable bedside test. Dick Halpick's and calorie test positive only in peripheral vertigo. All the bedside tests used in this study were very much significant for vertigo with the 'P' value of <0.001.

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