

**Original Research Article****Utility of Video Nystagmography (VNG) in Vertigo: A Prospective Study in Kashmiri Population**

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Abstract

Background: Vertigo is a symptom of vestibular dysfunction with a sensation of motion. It is one of the common presenting complaints in primary care institutions and emergency departments. 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. Vestibulonystagmography (VNG) has been recommended as a dependable investigation of vertigo & has been used at many big health institutions.

Aims and Objectives: To evaluate the role of Video Nystagmography (VNG) in the diagnosis of vertigo, & To assess the benefit of VNG in confirmation of canalolith repositioning in patients with BPPV after Epley's maneuver.

Methods: A Prospective Observational Study was conducted among patients of peripheral Vertigo attending ENT OPD at Government SMHS Hospital Srinagar. A total of 110 patients were included in the study. The patients were followed up on 7th day, 14th day and at 3 Months. Among patients of BPPV, Epley Maneuver was performed at first visit and 7th day follow up & its impact was assessed at 7th day and 14th day respectively. At 3 months both Dix Hallpike & VNG were performed.

Results & Discussion: Out of the five tests of VNG, four tests (which include Saccadic Test, Gaze Test, Optokinetic Test and Caloric Test) were Normal in all the 110 patients. The Position Test was Positive in 72.73% of patients which indicates that 72.73% patients had either BPPV or Vestibular Neuritis. Dix Hallpike test was positive in 75 cases (68%) & 35 patients (31.8%) had a negative result. The 75 BPPV patients were provided with Epley Maneuver & followed up on 7th & 14th day. 53 patients had a negative Dix hallpike test at 1st Follow-up Examination (Day 7), while as 22 had a positive Dix hallpike test. These 22 cases were further subjected to Epley Maneuver & followed for another week. On 2nd Follow-up Examination (Day 14), these 22 patients were subjected to assessment through Dix hallpike test & all had a negative result. Thus finally all such patients were symptom-free on 14th Day. On 3rd Follow-up Examination (at 3 Months), all the 110 patients were assessed through Dix hallpike & VNG; and both the tests were normal in all the 110 patients. Video Nystagmography (VNG) can differentiate between a central and peripheral vestibular lesion, and if peripheral it can decipher between unilateral and bilateral vestibular loss.

Conclusion: The VNG differentiated very efficiently between different diagnosis along with the side involved & Epley Maneuver was found very useful as a non-pharmacological management tool for BPPV. This benefit of Epley

Maneuver in patients of BPPV can be confirmed with VNG on follow up examination. It was concluded that Video nystagmography (VNG) is a simple, reliable and objective diagnostic tool for the evaluation of patients presenting with Vertigo & it can differentiate between a central and peripheral vestibular lesion, and if peripheral it can decipher between unilateral and bilateral vestibular loss.

Keywords: Vertigo, Diagnosis, Video Nystagmography, Epley Maneuver.

Introduction

Vertigo is a symptom of vestibular dysfunction with a sensation of motion (most commonly rotational motion). It is one of the common presenting complaints in primary care institutions and emergency departments⁽¹⁾. Vertigo is defined as the hallucination of movement, either of self (subjective) or the environment (objective). Different words are used by different patients about the type of motion being perceived which include Bouncing, Oscillating, Staggering, Swimming, Twisting Rolling, Spinning, Rocking, Lightheadedness, Imbalance, Floating, Fainting, Falling⁽²⁾.

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⁽³⁾. 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⁽³⁾. In order to reach the exact diagnosis, devise the best management plan & assess the prognosis of treatment a thorough history, clinical examination, various bedside tests like Head thrust test, Dynamic visual acuity, Head shaking test, Dix Hallpike's test, Fukuda's test and Calorie test and investigations like CT / MRI brain, X-Ray neck, Blood sugar, Lipid profile, Carotid vertebral Doppler are being used. Even after an exhaustive diagnostic protocol the validity of the diagnosis is sometimes being question marked & the search for some new and more valid diagnostic test continues. In recent past Vestibulonystagmography (VNG) has been recommended as a dependable investigation of vertigo & has been used at many big health institutions.

VNG is a test used to determine whether or not dizziness may be due to inner ear disease. It also assesses the function of the vestibular end organs, central vestibulo-ocular pathway and oculomotor processes. Video Nystagmography (VNG) is useful to test balance system and record nystagmus by a camera. There are neural connections that stretch balance mechanisms in inner ear to muscles of eye. Any disorder of balance mechanism produces small eye jerks that can only be detected by computer and frenzel's goggles^(4,5). It can be monitored by putting body in different positions by Dix Hallpike's test and Roll Over test. This study has been devised to assess the utility of VNG in the diagnosis of vertigo in Kashmiri population.

Video Nystagmography

Video nystagmography (VNG) was introduced by Ulmer in 1989, provides an objective assessment of the oculomotor and vestibular system, and is potentially useful to clinicians in otorhinolaryngology, neurology, and ophthalmology⁽⁶⁾.

Electronystagmography (ENG) is an important test done to evaluate patients with vertigo, dizziness and balance problems. The study of eye movements provides a lot of information about the functioning of the brain and the balance system. ENG is used to record eye movements in different conditions and with different tests. By analyzing these movements, we are able to understand the area affected by the disorder. ENG detects eye movements by virtue of a change in the corneo-retinal potential during these movements. The changes in potential are picked up by surface electrodes placed near the eyes of the patient. Findings of ENG must be correlated with the history given by the patient and other neuro-ontological tests to identify the cause of vertigo or dizziness.

Since the introduction of Video Nystagmography (VNG), ENG has lost its pride of position. VNG uses goggles fitted with infra-red cameras along with a computer and soft-ware. These cameras provide high resolution images of the eye movements which can be analyzed with much higher precision than ENG. ENG and VNG are used to record oculo-motor and vestibular tests.

Traditionally, ENG, which relies on the corneo-retinal potential to record eye movements, is considered the gold standard for evaluating dizzy patients⁽¹⁾. In contrast to ENG, VNG records eye movements using digital video image technology employing infrared illumination to determine eye position. The use of VNG enables simultaneous subjective observation of eye movements together with objective data collection and analysis of eye movement waveforms via computer algorithms. Recording makes it possible to measure quantitative parameters such as the speed of the slow component in different types of nystagmus, latency, saccade accuracy and velocity, and gain in ocular tracking and optokinetic nystagmus⁽⁷⁾.

Video nystagmography (VNG) tests include the following:

1. Tests of oculomotor function (with fixation) include saccade, tracking and optokinetic tests.
2. Tests of gaze stabilization (with or without fixation, alertness levels); includes gaze/spontaneous nystagmus, static position tests.
3. Caloric test.
4. Test for specific etiologies: includes Dix-Hallpike maneuver (dynamic positioning), pressure test (fistula).

Aims and Objectives

- To evaluate the role of Video Nystagmography (VNG) in the diagnosis of vertigo.
- To assess the benefit of VNG in confirmation of canalolith repositioning in

patients with BPPV after Epley's maneuver.

Material and Methods

The present study was conducted in the ENT department of Government SMHS Hospital Srinagar, which caters patients from whole of the Kashmir division.

Study Design: This Prospective Observational Study was conducted among the study participants attending the said hospital.

Study Period: The study was done for a period of 18 months from May 2020 up to October 2021.

Study Participants: All the patients of peripheral vertigo attending ENT OPD of Unit 3 of the Department during the study period.

Inclusion Criteria:

- Patients 21 to 70 years of age of either sex presenting with peripheral vertigo.

Exclusion Criteria:

- Patients of Central vertigo.
- Patients of vertigo with Severe Cervical Spinal disease, Uncontrolled Hypertension and active Heart ailments.

Sample Size: A minimum of 100 patients were planned to be taken for the study. All the patients presenting with vertigo to the OPD services of the concerned Unit of Department during the study period were considered for study. After taking an informed written consent, such cases were screened for inclusion and exclusion criteria. Only those patients who gave the consent & fulfilled the criteria were taken into the study. Thus a total of 110 patients were taken for the study during the study period.

Ethical Clearance: Ethical Clearance was obtained from the Institutional Ethical Committee of Government Medical College Srinagar, before the start of study.

Methods

All the patients of peripheral vertigo attending ENT OPD of Unit 3 of the Department during the study period were considered for enrollment into the study & after following the inclusion and

exclusion criteria a total of 110 patients were included into the study. Patients under the study were subjected to a detailed history & general examination along with clinical evaluation through complete ENT examination, audiological assessment and vestibular tests. The study subjects were also subjected to Video nystagmography (VNG) Tests.

Follow up examinations were done at 7th Day, 14th Day & at 3 months. All those patients who were diagnosed as cases of BPPV were subjected to Epley’s Maneuver & were assessed on 7th day with Dix Hallpike. Those patients who had a negative result on Dix Hallpike & whose symptoms were resolved were labelled as cured. Those patients who had a positive result on Dix Hallpike were subjected to Epley’s Maneuver again & on 14th day (second follow-up) these patients were again assessed with Dix Hallpike for recovery.

The third follow up was done at 3 months for all 110 patients under study. Both Dix Hallpike & VNG were performed at this follow-up & canalolith repositioning in patients with BPPV after Epley’s maneuver was confirmed.

Statistical analysis

Data was entered into Microsoft Excel spreadsheet & exported to data editor of Statistical Package for Social Sciences (SPSS Ver. 23) where in statistical analysis was done. Categorical variables were described as frequencies and percentages. Continuous variables were described as mean and standard deviation. Chi square test was used to analyze the relationship between two categorical variables & T- Test was used to compare a continuous variable between two groups. A p value of < 0.05 was considered as statistically significant.

Observations and Results

Table 1 VNG Test Findings

Symptoms	Type	Frequency	Percent
Saccadic Test	Normal	110	100
Gaze Test	Normal	110	100
Optokinetic Test	Normal	110	100
Caloric Test	Normal	110	100
Position Test	Normal	30	27.27
	Positive	80	72.73

Out of the five tests of VNG, four tests (which include Saccadic Test, Gaze Test, Optokinetic Test and Caloric Test) were Normal in all the 110

patients. The Position Test was Positive in 72.73% of patients which indicates that 72.73% patients had either BPPV or Vestibular Neuritis.

Table 2 Distribution of patients according to Saccadic Test of VNG

Saccadic Test	Test Result	Frequency	Percentage
Amplitude	Normal in Horizontal & Vertical Saccades	110	100%
Latency	Normal in Horizontal & Vertical Saccades	110	100%
Accuracy	Normal in Horizontal & Vertical Saccades	110	100%
Velocity	Normal in Horizontal & Vertical Saccades	110	100%
Symmetry	Normal in Horizontal & Vertical Saccades	110	100%

All the sub-tests of Saccadic Test had test result of Normal in Horizontal & Vertical Saccades, which

excludes any central nervous system abnormality among the patients.

Table 3 Distribution of patients according to Optokinetic Test & Gaze Test of VNG

VNG Test	Test Result	Frequency	Percentage
Optokinetic Test	Responses Preserved	110	100%
	Optokinetic Gain Symmetric	110	100%
Gaze Test	No Gaze Evoked Nystagmus	110	100%

Optokinetic Test had Responses Preserved & Gain Symmetric in all the 110 patients, thereby excluding cerebral, cerebellar and brain stem lesions.

In Gaze Test, No Gaze Evoked Nystagmus was observed in all the 110 patients, thus excluding any cerebellar pathology or any posterior fossa abnormality.

Table 4. Distribution of patients according to Position Test of VNG

Position Test Result	Frequency	Percentage	Diagnosis
Left Upbeat Torsional Nystagmus	39	35.5	Left BPPV
Right Upbeat Torsional Nystagmus	36	32.7	Right BPPV
No Positional Nystagmus	30	27.3	Meniere's disease
Horizontal Nystagmus Present	5	4.5	Vestibular neuritis
Total	110	100.0	***

On Position Test of VNG:

- 39 patients (35.5%) had Left Upbeat Torsional Nystagmus, which indicates Left BPPV.
- 36 patients (32.7%) had Right Upbeat Torsional Nystagmus, which indicates Right BPPV.

- 5 patients (4.5%) had Horizontal Nystagmus, which indicates Vestibular Neuritis.
- 30 patients (27.3%) had no nystagmus, which indicates Meniere's Disease.

Table 5 Distribution of patients at First Follow-up Examination (7TH Day). (n=75)

1st Follow-up Examination (Day 7)	Type	Frequency	Percent
Dix hallpike	Negative	53	70.67
	Positive	22	29.33

53 patients had a negative Dix hallpike test at 1st Follow-up Examination (Day 7), while as 22 had a positive Dix hallpike test. These 22 cases were

further subjected to Epley Maneuver & followed for another week.

Table 6 Distribution of patients at Second Follow-up Examination (14TH Day). (n=22)

2nd Follow-up Examination (Day 14)	Type	Frequency	Percent
Dix hallpike	Negative	22	100
	Positive	0	0

All the 22 patients had a negative Dix hallpike test at 2nd Follow-up Examination (Day 14).

Flowchart depicting diagnosis of patients & follow-up of BPPV patients

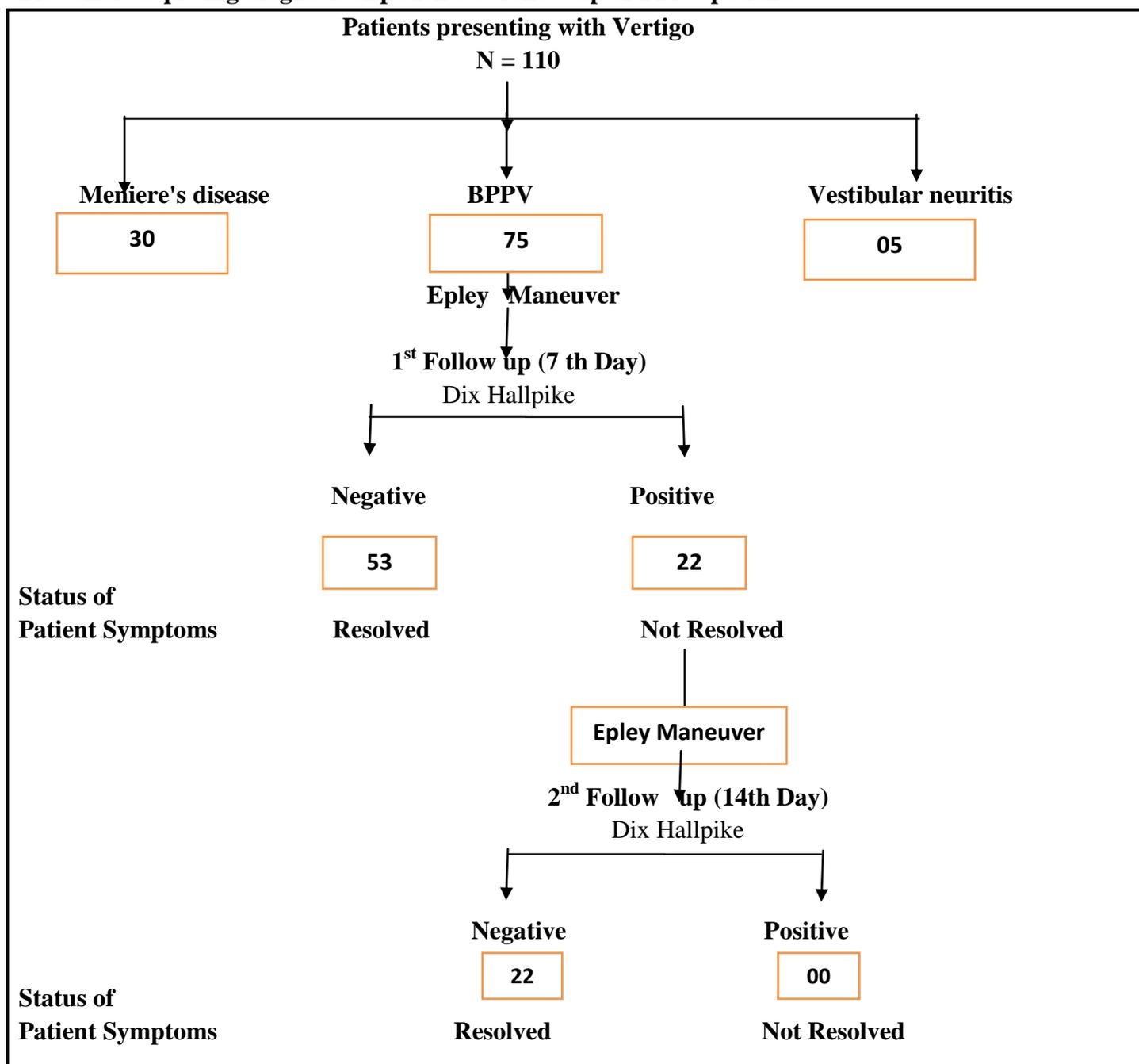


Table 7. Distribution of patients as per pathology

Diagnosis	Frequency	Percent
BPPV	75	68.2
Meniere's disease	30	27.3
Vestibular neuritis	5	4.5
Total	110	100.0

Out of 110 patients in this study 75 Patients (68.2%) had BPPV, 30 Patients (27.3%) had

Meniere's disease & only 5 Patients (4.5%) had Vestibular neuritis

Table 8. Distribution of patients according to Final Diagnosis

Final Diagnosis	Frequency	Percent
Left BPPV	39	35.5
Right BPPV	36	32.7
Meniere's disease	30	27.3
Vestibular neuritis	5	4.5
Total	110	100.0

39 Patients (35.5%) had Left BPPV, 36 Patients (32.7%) had Right BPPV, 30 Patients (27.3%) had

Meniere's disease & only 5 Patients (4.5%) had Vestibular neuritis

Table 9 Relationship between Diagnosis and Dix Hallpike

Dix Hallpike	Diagnosis			Total
	BPPV	Meniere's disease	Vestibular neuritis	
Left up beat torsional	38	0	0	38
Right upbeat torsional	37	0	0	37
Negative	0	30	5	35
Total	75	30	5	110

Chi square :110, P Value < 0.001

Dix Hallpike presented as Left up beat & Right upbeat torsional in all BPPV cases, while as it

presented as negative in Meniere's disease and Vestibular neuritis cases.

Table 10. Relationship between Diagnosis and Position Test

Position Test	Diagnosis			Total
	BPPV	Meniere's disease	Vestibular neuritis	
Negative	0	30	0	30
Positive	75	0	5	80
Total	75	30	5	110

Chi square :110.6 , P Value < 0.001

Position Test was positive in all the five cases of Vestibular neuritis and in all the 75 cases of BPPV, while as it was negative in all the 30 cases

of Meniere's disease. This association was statistically significant with a p value of < 0.001

Table 11. Distribution of patients at 3 Months Follow-up

Follow-up Examination at 3 Months	Result	Frequency	Percent
Dix hallpike	Positive	0	0
	Negative	110	100
VNG	Positive	0	0
	Normal	110	100

All the 110 patients had a Negative result on Dix hallpike & a Normal result on VNG at 3 Months.

Discussion

The present study was conducted in the Post Graduate Department of Otorhinolaryngology and Head and Neck surgery (ORL AND HNS), Government SMHS Hospital Srinagar for a period of 18 months from May 2020 up to October 2021. Patients aged 22 to 70 years of either sex presenting with the complaint of vertigo to the ENT OPD of Unit 3 of the Department during the study period were included in a Prospective

Observational Study. A total of 110 patients were included in the study. A detailed history, complete ENT examination, audiological assessment including PTA, clinical vestibular tests and VNG was carried out among all the patients. The patients were followed up on 7th day, 14th day and at 3 Months for further assessment. Among patients who were found to have BPPV, Epley Manuere was performed at first visit and 7th day follow up & its impact was assessed at 7th day and

14th day respectively. At 3 months both Dix Hallpike & VNG were performed. This study was conducted with following inclusion and exclusion criteria:

Video nystagmography (VNG)

Out of the five tests of VNG, four tests (which include Saccadic Test, Gaze Test, Optokinetic Test and Caloric Test) were Normal in all the 110 patients, which indicates that the cause of vertigo was peripheral. while as Position Test was Positive in 72.73% of patients. All the sub-tests of Saccadic Test had test result of Normal in Horizontal & Vertical Saccades. Optokinetic Test had Responses Preserved & Gain Symmetric in all the 110 patients. In Gaze Test, No Gaze Evoked Nystagmus was observed in all the 110 patients. The Position Test of VNG was positive for all the 75 BPPV patients and 05 Vestibular neuritis patients, while as it was negative among all the 30 Meniere's disease patients. In 36 (32.7%) patients of Vertigo, the Position Test showed a Right Upbeat Torsional Nystagmus indicating Right BPPV, while as in 39 (35.5%) patients of Vertigo, the Position Test showed a Left Upbeat Torsional Nystagmus indicating Left BPPV. In 30 (27.3%) patients of Vertigo, the Position Test showed No Positional Nystagmus indicating Meniere's disease; while as in 5 (4.5%) patients of Vertigo, it showed Horizontal Nystagmus indicating Vestibular neuritis. When these diagnoses were compared with clinical diagnosis, based on symptoms, signs and other tests, they were found to be exactly the same. Thus Video nystagmography (VNG) is a simple, reliable and objective diagnostic tool for the evaluation of patients presenting with Vertigo. The VNG also documents the benefits of Epley Maneuver among patients of BPPV. VNG can differentiate between a central and peripheral vestibular lesion, and if peripheral it can decipher between unilateral and bilateral vestibular loss. VNG addresses the functionality of each ear. Thus VNG helps document unilateral/bilateral loss of vestibular function, confirm benign peripheral positional

vertigo (BBPV), and detect central lesions that are missed during a routine physical examination. **Soha Mekki et al 2013**,⁽⁸⁾ published a study titled "The role of Video Nystagmography (VNG) in assessment of dizzy patient" in the Egyptian Journal of Otolaryngology. They concluded that VNG helps in finding out the cause of vertigo, including whether the cause is unilateral or bilateral. They also described the utility of VNG in detecting the central lesions that are missed during a routine physical examinations. These findings are very much similar to our findings.

Distribution of different Diagnoses of Vertigo

Out of the 110 patients included in the study, 75 (68.2%) had BPPV, 30 (27.3%) had Meniere's disease and 05 (4.5%) had Vestibular neuritis. Many studies have shown similar distribution of different diagnosis among patients of Vertigo with BPPV being the most frequent diagnosis. **Lee AT et al** (9) mentioned in their article titled "Diagnosing the cause of vertigo: a practical approach" that for peripheral vertigo, the most common cause is benign paroxysmal positional vertigo. **Bas Donmesi et al** (10) conducted a study titled "Etiological and Demographic Characteristics of Patients with Vestibular Symptoms, Retrospective Analysis" where in a total of 444 patients between the age of 6 and 89 years were included in the study. The most frequent cause of vertigo/dizziness was benign paroxysmal positional vertigo (59.23%) followed by unilateral/bilateral vestibular hypofunction (20.72%), central pathologies (14.63%), Meniere's disease (3.60%) and vestibular neuritis (1.80%). They concluded that the most common diagnosis was benign paroxysmal positional vertigo. **Jan Bermeister et al** (11) found in their study titled "Prevalence, demographics, and clinical characteristics of vertigo disorders in a specialized multidisciplinary outpatient clinic" that the five most common diagnoses were phobic postural vertigo, benign paroxysmal positional vertigo, vestibular neuritis, psychogenic vertigo and Ménière's disease.

Thus the results of both these studies are very much similar to the results of our study with respect to the relative proportion of different diagnoses of Vertigo.

Epley Maneuver & follow up assessment with Dix hallpike

Dix Hallpike test was positive in 75 cases (68%). 36 patients (33.6%) had Right upbeat torsional result, 39 patients (34.5%) had Left upbeat torsional result & 35 patients (31.8%) had a negative result on Dix Hallpike. Dix Hallpike presented as Left up beat & Right upbeat torsional in all BPPV cases, while as it presented as negative in Meniere's disease and Vestibular neuritis cases. The 75 BPPV patients were provided with Epley Maneuver & followed up on 7th & 14th day for response to management. 53 patients had a negative Dix hallpike test at 1st Follow-up Examination (Day 7), while as 22 had a positive Dix hallpike test. These 22 cases were further subjected to Epley Maneuver & followed for another week. On 2nd Follow-up Examination (Day 14), these 22 patients were subjected to assessment through Dix hallpike test & all had a negative result. Thus finally all such patients were symptom-free on 14th Day. On 3rd Follow-up Examination (at 3 Months), all the 110 patients were assessed through Dix hallpike & VNG; and both the tests were normal in all the 110 patients. Thus Epley Maneuver benefits the patients of BPPV, and this can be confirmed with VNG on follow up examination. Patients with benign paroxysmal positional vertigo benefit from non-pharmacologic agents. The primary treatment for BPPV is focused on head rotation maneuvers that displace calcium deposits back to the vestibule through canalith repositioning or the Epley maneuver. The benefit of the Epley maneuver is that the patient at home can perform it. To perform a modified Epley maneuver, patients are instructed to position themselves upright on a bed with their head turned 45 degrees to the left and a pillow behind them. The pillow should be positioned so that when supine, the pillow is directly under their shoulders. Once the patient is

in position, they should lie back quickly onto the pillow, so the head is reclined onto the bed. They should hold this position for 30 seconds. Without raising their head, they should then turn their head 90 degrees to the opposite side (right) and hold this position for another 30 seconds. After 30 seconds, they should turn their body and head another 90 degrees to the right and wait for another 30 seconds. Finally, they should sit up on the right side of the bed. This maneuver can be repeated starting on the opposite side and should be performed at least three times a day until the patient has no further episodes of positional vertigo for 24 hours. The Epley maneuver is effective in 50 to 90% of patients. **Shah S and Vishwakarma R in 2014** (12) studied 35 patients of BPPV presenting at vertigo clinic of ENT Department at Civil Hospital Ahmedabad treated with canalolith repositioning procedure (CRP) and improved in nystagmus and confirmed by VNG. They included 35 patients suffering from BPPV with positive history of positional vertigo, confirmed with Dix hallpike's test and nystagmus was recorded with VNG. VNG showed improvement in nystagmus immediately in 31 patients after 1st CRP, 3 patients showed improvement on VNG with 2nd CRP and 1 with 3rd CRP. They concluded that Video Nystagmography is a very useful tool for ensuring the otolith repositioning by the canalith repositioning maneuver. It is a confirmatory adjunct to visual analysis. **Das S, Chakraborty S, Shekar S in 2017** (13) conducted a study titled as "dizziness in a tertiary care center in Sikkim: our experience and limitations". They concluded that complete evaluation of a dizzy patient must be done to arrive at a causal diagnosis. Injudicious use of vestibular sedatives should be discouraged. They suggested that a proper training and education to the primary care physician should be imparted so that they can adopt a practical approach for evaluation and management of a dizzy person.

Mc-Caslin DL et al (14) published in their research paper titled as "Current role of the

videonystagmo-graphy examination in the context of the multidimensional balance function test battery” in the year 2009 that VNG helps document unilateral/bilateral loss of vestibular function, confirm benign peripheral positional vertigo (BPPV), and detect central lesions that are missed during a routine physical examination. They also mentioned that VNG helps to decide whether additional tests (e.g. MRI) are needed and helps in preoperative evaluation of such patients. These results from these studies are consistent with the results from our study.

Video nystagmography (VNG) has the benefit of not requiring skin preparation or electrode application and wiring. Moreover, adjustments are seldom required as VNG does not depend on changes in corneo-retinal potential over time in contrast to ENG. However, VNG is unable to record eye movements when the eyes are closed (15). Video nystagmography (VNG) can differentiate between a central and peripheral vestibular lesion, and if peripheral it can decipher between unilateral and bilateral vestibular loss. VNG addresses the functionality of each ear (16).

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of GMC Srinagar

Conclusion

Vertigo is a symptom of vestibular dysfunction with a sensation of motion, whose underlying cause needs to be elucidated so that proper management is planned. The diagnosis protocol of Vertigo is an exhaustive one including detailed history, thorough examination and a long set of bedside tests; & even after that there is sometimes a diagnostic dilemma. In our study BPPV was the most common diagnosis followed by Meniere's disease. The Position Test of VNG differentiated very efficiently between different diagnoses along with the side involved & Epley Maneuver was found very useful as a non-pharmacological management tool for BPPV. This benefit of Epley

Maneuver in patients of BPPV can be confirmed with VNG on follow up examination. It was concluded that Video nystagmography (VNG) is a simple, reliable and objective diagnostic tool for the evaluation of patients presenting with Vertigo & it can differentiate between a central and peripheral vestibular lesion, and if peripheral it can decipher between unilateral and bilateral vestibular loss.

Recommendation

It is thus recommended that VNG equipment should be installed at as many hospitals & health centers as possible and the staff should be provided with necessary training regarding its usage, so that VNG is utilized as an important diagnostic tool for patients presenting with Vertigo.

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