

# Electronystagmographic study of the vertigo patients

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## Abstract

**Introduction:** The word “vertigo” comes from the Latin word “vertigo”- to run, the suffix “- igo” = a condition of turning about). Vertigo is defined as the sensation of movement of self or environment. One of the most common presenting complaints patients bring to their family physicians and ENT surgeons is dizziness. In day-to-day ENT practice, incidence of dizziness is reported to be 10-15 %. **Aims and Objectives:** To Study Electronystagmographic of the Vertigo Patients. **Material and Methods:** This is a perspective study which was conducted in the Department of Otorhinolaryngology, tertiary care center. This study was done in tertiary care and Medical college. Data collection-18 months from January 2014 to June 2015. Data analysis-6 months from July 2015 to December 2015. Sample size included patients who presented with primary complaints of vertigo in our Otorhinolaryngology OPD. Sample size was 73 patients. All cases attending the ENT OPD with the vertigo, Patients with dizziness and vertigo, All age groups Both males and females included into study. **Result:** On non-caloric ENG test 3 patients showed smooth pursuit nystagmus abnormality on pendulum test and 3 showed asymmetric Opt kinetic test, 26 patients showed abnormal on positional test on 3 positions suggestive of BPPV. Butterfly chart showed 29 normal response which consists patients suffering from BPPV and a patient in which pathology was not located. 2 patients had B/L peripheral lesion. 20 patients showed RT vestibular lesion of which 5 were having ↓ RT cold response suggestive of Meniere’s disease. 16 patients showed Lt vestibular lesion of which 3 were having ↓Lt cold response suggestive of Meniere’s disease. Caloric response in 1 patient indicated B/L Brainstem lesion, 1 patient of RT Brainstem lesion, 1 patient of RT cerebellar lesion and 1 patient of Lt Cerebella. 2 patients showed no localization of pathology and considered as undetermined. Overall ENG findings showed normal response in 29 patients, peripheral lesion in 38 patients, central lesion in 4 patients, no localization of pathology in 2 patients. **Conclusion:** Electronystagmographic Study of the Vertigo Patients is helpful for detection of type of lesion .i.e. peripheral or central and various causes of vertigo like Meniere’s disease, BPPV, and Brain stem lesion etc.


**Key Words:** Electronystagmography, Vertigo.

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## INTRODUCTION

The word “vertigo” comes from the Latin word “vertigo”- to run, the suffix “- igo” = a condition of turning about). Vertigo is defined as the sensation of movement of self or environment.<sup>2</sup> One of the most common presenting complaints patients bring to their family physicians and ENT surgeons is dizziness. In day-to-day ENT practice, incidence of dizziness is reported to be 10-15%.<sup>1</sup> Because patients with incidence of dizziness often have difficulty

describing their symptoms, determining the cause can be challenging. An evidence-based approach using knowledge of key historic, physical examination, and radiologic findings for the cause of vertigo can help family physicians establish a diagnosis and consider appropriate treatments in most cases. Dizziness was most effectively defined by Herr as a subjective sense of imbalance which may or may not include sensation of rotation.<sup>2</sup> Dizziness can be classified into four types of dizziness: vertigo, disequilibrium, pre-syncope, and light headedness.<sup>3</sup> Usually the perceived movement is rotator-a spinning or wheeling sensation- but some patients simply feel pulled to one side. However they are described, dizziness and vertigo may be disturbing and even incapacitating, particularly when accompanied by nausea and vomiting. Half of the impact of dizziness on social and working life is considerable. Half of the patients affected by dizziness feel that their efficiency at work has substantially dropped and one-quarter of patients even give up or change their work as a result of dizziness.<sup>4</sup> The symptom may result from a disease due to various causes

(with both the peripheral or central vestibular or retro-vestibular etiology), differing in severity (from minor to very severe) and prevalence, while its early diagnosis can be of immense importance for further fate of the affected person.<sup>5,6</sup>

**Electronystagmography:** Electronystagmography (ENG) is a study used to clinically evaluate patients with dizziness, vertigo, or balance dysfunction. ENG provides an objective assessment of the occulo-motor and vestibular systems. The vestibular system monitors the position and movements of the head to stabilize retinal images. This information is integrated with the visual system and spinal afferents in the brain stem to produce the vestibule-ocular reflex (VOR).<sup>7</sup> ENG abnormalities can be useful in diagnosis and localization of site of lesion. The comparison of results obtained from various subsets of ENG assists in determining whether a disorder is central or peripheral.

**Vertigo:** Vertigo is not a single disease entity but the cardinal symptom of different diseases of varying etiology; these may arise from the inner ear, brainstem, or cerebellum or may be of psychic origin.<sup>8,9</sup> True vertigo has been variously described but its best described as – an illusion of movement with respect to one’s surrounding space. Most of cases have a rotator component. A brief description of important conditions producing true vestibular vertigo follows. It is most important to distinguish between peripheral (labyrinthine) abnormalities and those involving central vestibular connection. The key to this distinction is the neurologic evidence for or against involvement of neighboring brainstem structures.

**Meniere’s syndrome:** According to these guidelines, Meniere’s disease is defined as “Recurrent, spontaneous vertigo, hearing loss, aural fullness and tinnitus. Either tinnitus or aural fullness or both must be present on the affected side to make diagnosis.”<sup>10</sup> Audiometric studies are used to evaluate lesions of the middle ear, labyrinth, and cochlear nerve, particularly in Meniere’s disorder and cerebello-pontine angle tumors. Routine pure tone audiometry indicates the presence or absence of a hearing loss and may also distinguish banal causes

(acoustic trauma, aging and otosclerosis) from specific cochlear and nerve disorders.<sup>11</sup>

**Electronystagmography:** Electronystagmography (ENG) is a study used to clinically evaluate patients with dizziness, vertigo, or balance dysfunction. ENG provides an objective assessment of the occulo-motor and vestibular systems. The vestibular system monitors the position and movements of the head to stabilize retinal images. This information is integrated with the visual system and spinal afferents in the brain stem to produce the vestibule-ocular reflex. Essentially, the standard ENG test battery consists of the following 3 parts: Oculomotor evaluation, positioning/positional testing, and caloric stimulation of the vestibular system. ENG abnormalities can be useful in diagnosis and localization of site of lesion. Nystagmus: Nystagmus is described as an involuntary eye movement which can be horizontal, Vertical, oblique, or torsional.<sup>12</sup> On recording, nystagmus resembles a saw-tooth waveform.<sup>13</sup>

**MATERIAL AND METHODS**

This is a perspective study which was conducted in the Department of Otorhinolaryngology, tertiary care center. This study was done in tertiary care and Medical college. Data collection-18 months from January 2014 to June 2015. Data analysis-6 months from July 2015 to December 2015. Sample size included patients who presented with primary complaints of vertigo in our Otorhinolaryngology OPD. Sample size was 73 patients. All cases attending the ENT OPD with the vertigo, Patients with dizziness and vertigo, All age groups Both males and females included into study. Ophthalmic conditions like cataract, corneal ulcers, blindness, retinopathies, Epilepsy, Eye surgery within previous 3 months, Ear surgery within 6 months, Perforated drums, Psychotic/ neurotic disorders, Pacemaker and other cardiac problems in acute or decompensate state, Patients with claustrophobia, fear of the dark, uncontrollable tremors, Patients with difficulty in focusing on objects, Patients having acute severe vertigo (caloric test cannot be performed in these patients), Patients who refuse follow up were Excluded from the study.

**RESULT**

**Table 1:** Distribution of patients according to Non-caloric ENG test

	No. of patients	Percentage (%)
Spontaneous nystagmus-No effect on eye closure	6	4.1
Spontaneous nystagmus-Enhancement on eye closure	64	87.67
Spontaneous nystagmus-Supprression on eye closure	3	4.1
Smooth pursuit nystagmus abnormality	3	4.1
Asymmetric Optokinetic test	3	4.1
Abnormal nystagmus on positional test	26	35.61

On non-caloric ENG test 3 patients showed smooth pursuit nystagmus abnormality on pendulum test and 3 showed asymmetric Opt kinetic test, 26 patients showed abnormal on positional test on 3 positions suggestive of BPPV.

**Table 2:** Distribution of patients according to different butterfly chart codes seen in caloric test

Code	No. of patients	interpretation	Inference
<b>Normal(29)</b>			
0000	29	Normal response	BPPV,Undetermined,migraine
<b>Peripheral (38)</b>			
1111	1	B/L canal paresis	B/L vestibular lesion
1110	1	B/L canal paresis	B/L vestibular lesion
1100	11	Rt canal paresis	Rtvestabular
1000	4	Rt canal paresis	Rtvestabular
0011	13	Lt canal paresis	Lt vestibular
0100	5	↓Rt cold response	Rtvestabular
0001	3	↓Lt cold response	Lt vestibular
<b>Central (4)</b>			
2222	1	B/L nystagmus inhibition	B/L Brainstem lesion
1001	1	Rt directional inhibition	R/t Brainstem lesion
2200	1	Rtcoloric hyperactive	L/t cerebellar lesion
0022	1	Lt caloric hyperactive	R/t cerebellar lesion
<b>Undermined (2)</b>			
0220	1	Rt directional preponderance	Pathology not localized
2002	1	Lt directional preponderance	Pathology not localized

Butterfly chart showed 29 normal response which consists patients suffering from BPPV and a patient in which pathology was not located. 2 patients had B/L peripheral lesion. 20 patients showed RT vestibular lesion of which 5 were having ↓ RT cold response suggestive of Meniere’s disease. 16 patients showed Lt vestibular lesion of which 3 were having ↓Lt cold response suggestive of Meniere’s disease. Caloric response in 1 patient indicated B/L. Brainstem lesion, 1 patient of RT Brainstem lesion, 1 patient of RT cerebellar lesion and 1 patient of Lt Cerebella. 2 patients showed no localization of pathology and considered as undetermined.

**Table 3:** Distribution of patients according to Butterfly chart disease localization in caloric test of E.N.G.

Category	No. of patients	Percentage (%)
Normal response	29	39.7
Peripheral	38	52.1
Central	4	5.47
Not localized	2	2.73

Overall ENG findings showed normal response in 29 patients, peripheral lesion in 38 patients, central lesion in 4patients, no localization of pathology in 2 patients.

## DISCUSSION

Enhancement of nystagmus on eye closure is indicating of peripheral lesion. In our study (87.67%) 64 patients showed enhancement of nystagmus on eye closure which was eventually diagnosed with peripheral vestibular lesion. 4.1% patients showed suspension of nystagmus in our study. Suspension of nystagmus on closure is suggestive of central lesion. Smooth pursuit nystagmus

abnormality on pendulum test and asymmetric optokinetic test indicates central pathology. Abnormal nystagmus on positional test directs towards diagnosis of BPPV. In study done by Sharma V and Shah RK, they found smooth pursuit abnormality in 1.45% and asymmetric Optokinetic test in 2.17% and positional test abnormality in 5.79% patients.<sup>14</sup>

**Butterfly chart codes seen in caloric test**

Study	Normal (%)	Peripheral inhabitation (%)	Meniere’s disease (↓cold response %)	Central inhibition (%)	Central dis-inhibition (%)	Un-determined (%)
Sharma V and Shah RK (2014) <sup>87</sup>	8.6 (0000)	76.81 (110,0011,1010)	3.62 (0101)	2.89 (0110,1001)	5.7 (2200,0022)	2.89 (0220,2002)

**Normal butterfly pattern in a study**

Study	No. of patients	Normal pattern “0000” in percentage (%)
Sharma Vand Shah RK (2014) <sup>14</sup>	138	8.6

In our study normal butterfly with code ‘0000’ was comparable to other studies Sharma Vand Shah RK (2014)<sup>14</sup> patients suffering from BPPV showed normal caloric response as torsional nystagmus of BPVV could not be elicited on single channel ENG machine used by us.

Butterfly chart disease localization				
Study	Normal	peripheral	central	Not localized/Mixed
Shi M <i>et al</i> (1997)	-	32.86	61.08	6.04
Biwa’s A. 8	31.16	28.23	26.93	13.58
Sharma V and Shah RK (2014) <sup>14</sup>	8.69	80.43	7.97	2.89

In our study of normal response on butterfly chart was comparable to other studies Shi, Biwa’s A. 8, Sharma V and Shah RK (2014).<sup>14</sup> Peripheral disease localization was also comparable to other studies. In our study central disease localization was less than other studies. It might be due to inability of interpretation of vertical or torsional nystagmus produced by central disease by single channel ENG machine and less flow of patients having central pathology in our setup.

**CONCLUSION**

Electronystagmographic Study of the Vertigo Patients is helpful for detection of type of lesion .i.e. peripheral or central and various causes of vertigo like Meniere’s disease, BPPV, and Brain stem lesion etc.

**REFERENCES**

1. Kroenke K, Lucas CA, Rosenberg ML, Scherokman B, Herbers JE Jr, et al. Causes of persistent dizziness. A prospective study of 100 patients in ambulatory care. *Ann Intern Med.* 1992; 117:188-904.
2. Nazareth I, Yardley L, Queen N, Luxon R. Outcomes of symptoms of dizziness in general practice community sample. *Fampract* 1999; 16:616-8.
3. Hanley K, O’Dowd T, Consider N. A systematic review of vertigo in primary care, *Br J Gen Pract.* 2001; 51:666-71.
4. Bronstein AM, Golding JF, Gresty MA, Mandala M, Nutii D, Shetye A, Silove Y: The social impact of dizziness in London and Siena. *JNeuro*2010, 257:183-90.

5. Jozefowicz-Korczynske M, Lukomski M, Pajor A. Electronystagmographic evaluation of the vestibular organ condition in patients with tinnitus and cervical spine degeneration. *Otolaryngol pol* 2004; 58(2):349-53[in Polish].
6. Olszewski J, Repetowski M. Clinical analysis of cervical vertigo patients in the own material. *Otolaryngol Pol* 2008; 62(3): 283-7.
7. Tilaike C, Pelisson D. Ocular motor syndromes of the brainstem and cerebellum. *Curropin neurol.* Feb 2008; 21 (1):22-8.
8. Brandt T, Dieterich M, Strupp M: *Vertigo – LeitsymptomSchwindel.* 2<sup>nd</sup>ed. Heidelberg: Springer Medizin; 2012.
9. Strupp , Brandt T: *Diagnosis and treatment of vertigo and dizziness.* *DTschArzteblattInt* 2008; 173-80.
10. Monsell EM. New and revised reporting guidelines from the Committee on Hearing and Equilibrium. American Academy of Otolaryngology – Head and Neck Surgery Foundation (AAO-HNS), Inc. *Otolaryngol Head Neck Surg* 1995;113:176-8.
11. Mukharjee, A, Chatterjee, S.K. Chakravarty, A *Vertigo and Dezziness – A Clinical Approach.*JAPI. 2003; 51(Nov): 1095-1101.
12. Brain, K. (2006) *Current State of Static Position Testing.* [Online] *Audiology Online.* Available from:[http://www.audiologyonline.com/articles\\_detail Asp?article\\_id=1540](http://www.audiologyonline.com/articles_detail_Asp?article_id=1540).
13. Carl, J.R. *Principles and Techniques of Electro-oculography.* In : Jacobson, G.P, Newman, C.W, Kartush, J.M (eds.) *Handbook of balance function testing.* Delmar: New York: 1997.
14. Sharma, V. Shah, R.K. Conventional vestibular function tests vs. butterfly vestibulometry in peripheral vertigo. *Nepal Journal of Medical Sciences.* 2014;03(1): 31-37.

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