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ORIGINAL ARTICLE

Findings of Video Head Impulse Test in Vestibular Neuritis

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ABSTRACT

Background: Vestibular neuritis is an acute unilateral peripheral vestibular disease without other signs of brain stem involvement. A comprehensive multidisciplinary assessment of VN patients including history and vestibular function tests holds great promise for more effective diagnosis. The video head impulse test (vHIT) assesses the vestibulo-occular reflex (VOR) by using a video-assisted examination of the impulsive maneuver. We studied the result of vHIT in normal population versus vestibular neuritis patients..

Subjects and methods: A case control study was conducted in Audio-vestibular unit, Department of ENT, Zagazig University Hospitals. 24 patients with vestibular neuritis were included. vHIT was done.

Results: We calculated gain, gain asymmetry in the study group and compare the results with control group.

Conclusion: vHIT is the only test that assesses all sixsemicircular canals independently and with a physiological stimulus, similar to how the patient uses the vestibular ocular reflex system in daily life.

Keywords: vestibular neuritis,VOR, vHIT.

INTRODUCTION

Vestibular neuritis represents 5% of all dizziness causes (15% of vestibular causes of dizziness). [1] It diagnosed clinically by history of: acute onset of persistent rotational vertigo, postural imbalance associated with nausea and vomiting without hearing loss lasting approximately 24-72 hours. After several days, the symptoms subsides gradually with varying degrees of dizziness or imbalance with head movement.[2]

Video head impulse test (vHIT) is a relatively new objective quantitative test of vestibular function. It was described by **Halmagi and Curthoys in 1988**. It is a video based equipment test that enables to detect the eye response (vestibulo-ocular reflex) to sudden head impulse stimulations. It used to measure the gain of the vestibulo-ocular reflex and to detect refixation saccades which are detected by using head impulse stimulations. It assesses all semicircular canals individually. [3]

We thought that vHIT has an additional role in diagnosis of vestibular neuritis.

SUBJECTS AND METHODS

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

All participants in the current study were subjected to the following:

Full history taking:including personal, general medical, otological and detailed dizziness history.

Otological examination.

Basic audiological evaluation.(audiometry and immittancemetry)

Video head impulse test :The vHIT was performed using an Otometrics ICS impulse

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system. Recordings were obtained for each of the six semicircular canals in all patients (horizontal, LARP, RALP).

STATISTICAL ANALYSIS

Continuous variables were presented as the mean±SD (normally distributed) or median(range) if not normally distributed. Normality was checked by Shapiro-Wilk test. Homogeneity of variances was checked by Leven's test. Categorical variables were presented by the count and percentage.

Fisher's Exact Test: for (2X2) (RXC) table is used to discover if there is a relationship between two categorical variables. It is an alternative to chi-squared test when the expected cell count is less than five.

Independent-samples t-test: is used to determine if a difference exists between the means of two independent groups on a continuous dependent variable.

Mann-Whitney U test: (nonparametric alternative to independent-samples t-test).

Cohen's Kappa: is a measure of inter-rater agreement for categorical variables when there are two raters.

Threshold for significance:

P-value<.05 indicates a statistically significant difference, P≤.01 indicates a highly a statistically significant difference, P≤.001 indicates a very highly statistically significant difference while, P≥.05 indicates a non-statistically significant difference.

Two-sided tests were used throughout.

All statistical analyses were performed using IBM SPSS Statistics, version 24 (IBM; Armonk, New York, USA).

RESULTS

In the present study, Patients with vestibular neuritis had highly significantly lower lateral right gain compared to left lateral gain Other differences between right and left gain were non-significant (P>0.05), as shown in Table(1).

Compared to controls, patients with vestibular neuritis had statistically significantly higher lateral gain asymmetry (P=0.02), but no statistically significant difference in gain asymmetry (RALP and LALP) were found (P=0.83 vs P=0.24), as shown in Table(2)

In the present study, not all the patients studied showed covert and overt corrective saccades in the vHIT tests. Almost 8 patients (33%) presented overt saccades; 5 patients (20%) presented covert saccades as showed in table (3).

Also we found that the most affected canals in the study group were the lateral canals (29.1%) and the number of uni-canal affection (45%) greater than multi-canal affection (4.2%) Table (4)

In the present study, there was no-statistically significant effect of age on vHIT parameters in vestibular neuritis patients as shown inTable (5)

There was statistical significant +ve correlation between disease duration and gain of right lateral canal among the study group as shown inTable (6)

Table (1): Gain in video-head impulse (vHIT) in patients with vestibular neuritis:

Gain %	Rt	Lt	Independent samples-t test	P-value
	n=24	n=24		
Gain				
Lateral %			3.09	**0.003 (S)**
mean±SD	0.77±0.31	1.11±0.44		
Anterior %			1.90	0.06 (NS)
mean±SD	1.08±0.29	1.25 ±0.33		
Posterior %			0.75	0.45 (NS)
mean±SD	1.14±0.49	1.06±0.19		

Table (2): Gain asymmetry in video-head impulse (vHIT) in patients with vestibular neuritis and control group

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Gain asymmetry (%)	Study group n=24 Median(Range)	Control group n=24 Median(Range)	Mann-Whitney U test	P –value
Lateral	8(0-47.5)	5(0-6.9)	312	**0.02 (S)**
RALP	6(1-22)	5.5(1-6.5)	135.6	0.83(NS)
LARP	4(1-20)	4(1-7)	213.4	0.24(NS)

Table (3): Saccades in video-head impulse (vHIT) in patients with vestibular neuritis

Saccades	Cases=24
LAT	
COVERT, n (%)	
Negative	21(88)
Right positive	3(12)
OVERT, n (%)	
Negative	18(75)
Right positive	6(25)
LARP	
COVERT, n (%)	
Negative	24(100)
OVERT, n (%)	
Negative	24(100)
RALP	
COVERT, n (%)	
Negative	22(92)
Right anterior positive	2(8)
OVERT, n (%)	
Negative	22(92)
Left posterior positive	2(8)

Table (4): Semicircular canal affection in patients with vestibular neuritis by vHIT.

Affected canal, n (%)	Cases=24
Unilateral canal affection	
Lateral canal	7(29.1)
Posterior canal	3(12.5)
Anterior canal	1(4.2)
Multi- canal affection	1(4.2)
No affection	12(50)

Table (5): Correlation between Age and vHIT measures in study group:

Variable	Age	
	R	P
Gain of lateral canal (right):	-0.708	0.105
Gain of lateral canal (left):	-0.695	0.111
Gain of anterior canal (right):	-0.621	0.604

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Gain of anterior canal (left):	-0.007	0.660
Gain of posterior canal (right):	-0.045	0.796
Gain of posterior canal (left):	-0.035	0.811
Gain of asymmetry of lateral canal:	-0.714	0.103
Gain of asymmetry of RALP canal:	-0.033	0.552
Gain of asymmetry of LARP canal:	-0.467	0.204

Table (6): Correlation between disease duration and both caloric and vHIT measures in study group

Variable	Disease duration (months)	
	R	**P**
Gain of lateral canal (right):	**0.45**	**0.03***
Gain of lateral canal (left):	-0.18	0.41 NS
Gain of anterior canal (right):	-0.11	0.60 NS
Gain of anterior canal (left):	-0.11	0.60 NS
Gain of posterior canal (right):	-0.14	0.50 NS
Gain of posterior canal (left):	-0.14	0.50 NS
Gain of asymmetry of lateral canal:	-0.07	0.74 NS
Gain of asymmetry of RALP canal:	0.26	0.26 NS
Gain of asymmetry of LARP canal:	0.13	0.56 NS

DISCUSSION

Vestibular neuritis is an acute unilateral peripheral vestibular disease without other signs of brain stem involvement. A comprehensive multidisciplinary assessment of VN patients including history and vestibular function tests holds great promise for more effectively diagnosis.

We assess the results of the vHIT in normal population versus vestibular neuritis patients.

The assessment of the vHIT results relies on the analysis of both the gain and gain asymmetry of the VOR and refixation saccades. Yang et al. [4] hypothized that the normative values of vHIT gain are >0.8 without saccades. This was consistent with the results of the control group but disagreed with Halmagyi et al. [5] who found that values of vHIT gain more than 0.6 is considered normal.

In this study, patients with vestibular neuritis had highly significantly lower lateral right gain (P=0.005). Other differences in right and left gain in both groups were non-significant.

The cause of high affection of lateral canals may be related to the anatomic basis of superior vestibular nerve which supplies the horizontal semicircular canal (along with reduced diameter and increased bony trabeculae of the bony canal housing the superior vestibular nerve and its divisions) make it more likely to be involved in cases of vestibular neuritis opposite to double supply of the IVN in two separate bony canals Taylor et al. [6] . This finding disagreed with Milonski et al. [7] and Mangabeira et al. [8] who found that up to 42% of VN patients present affection in the posterior semicircular canal

In the present study, it was found that not all studied patients showed covert and overt corrective saccades in the vHIT results. Zellhuber et al. [9] focused on CSs as well as vHIT gain values to evaluate hypo function in patients with vestibular disorders as using

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gain and CS improved diagnostic accuracy and the sensitivity of vHIT for identifying vestibular loss. This was disagreed with Yang et al. [4] who found that the studies of diagnosis of VN using vHIT relied on gain parameters only but not CS measurements to detect the presence of vestibular hypo function.

Also we found that the most affected canals in the study group were the lateral canals (29.1%) and the number of uni-canal affection (45%) greater than multi-canal affection (4.2%) .

In this study, there was no statistically significant effect of age on vHIT parameters. This finding may be related that all subjects in this study were on the middle age. Regarding the individual function of the vestibular end organs, research has revealed that the functions of all six semicircular canals decline with age starting at age of 40 years Mossman et al. [10] Therefore, the age effect in the present study did not reach significance.

In our study, there were statistical +ve correlation between disease duration and gain of right lateral canal among the study group as in the sequela phase of vestibular neuritis (after 1 to 3 monthes), the vHIT gain recovers at greater velocity until normality returns. Rambold [11] This result also was inagreement with Magliulo, et al. [12] who found that 85.7% of patients had resumed normal vHIT within 1 year after onset.

CONCLUSION

Video head Impulse test is the only test that assesses all sixsemicircular canals independently and with a physiological stimulus, similar to how the patient uses the vestibular ocular reflex system in daily life.

Conflict of interset:no
Financial Disclosures:no

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