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Diagnostic Value of Computerized Dynamic Posturography in the Assessment of Peripheral Vestibular Disorders

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ABSTRACT

Objectives: This study aims to determine the sensitivity, specificity, positive predictive value and negative predictive value of Computerized Dynamic Posturography (CDP) in properly labeling patients with peripheral vestibular disorders by Videonystagmography (VNG) as having vestibular dysfunction.

Methods:

Design: Case - Control Study

Setting: Tertiary Private Hospital

Subjects: Twenty-three (23) patients aged 18 and above with no history of hypertension or cardiovascular disease and no intake of anti-vertigo medications for at least 48 hours prior to testing and with complete VNG and CDP results obtained on the same day or at least two days apart were included in the study. Cases were defined as those diagnosed with a peripheral vestibular disorder by VNG while controls were defined as those with normal VNG results. Sensitivity, specificity, positive predictive value and negative predictive value of CDP in labeling those with peripheral vestibular disorders as vestibular were determined using VNG as gold standard.

Results: There were 11 cases (4 males, 7 females) and 12 controls (8 males, 4 females). Using VNG as the gold standard for diagnosing peripheral vestibular disorders, CDP had a sensitivity of 45.45% and specificity of 66.67% with Positive Predictive Value(PPV) of 55.56% and Negative Predictive Value(NPV) of 57.14% in assessing peripheral vestibular disorders among the adults tested. Interestingly, 33.33% of patients with normal VNG may actually have had a vestibular dysfunction that could be detected by CDP.

Conclusion: Prospective studies with larger sample sizes utilizing VNG and CDP are recommended in order to verify our findings.

Keywords: *dizziness, posturography, vertigo*

Dizziness is one of the most common complaints of patients seeking medical attention. The estimated prevalence of dizziness in the general population is said to be around 20 to 30%[1] with a reported prevalence rate of 2.5% for dizziness and vertigo at a tertiary hospital in the Philippines.[2] The term dizziness has been described as a spinning sensation, floating or lightheadedness and falling or loss of balance. When dizziness is described as a spinning sensation either of self, the environment or both, we call this type of dizziness vertigo. Peripheral vestibular disorders which include Benign Paroxysmal Positional Vertigo (BPPV) represent the most common group of the vertiginous diseases.[1]

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A good history and physical examination have remained a very reliable tool in the diagnosis of most vestibular conditions.[3] However, in conditions where the diagnosis of vertigo remains unclear even after a detailed medical examination, videonystagmography (VNG), a test that evaluates the presence of pathologic nystagmus has been a helpful tool in assessing the presence of a vertiginous disorder.[4] Nevertheless, criticisms regarding its use abound as it (1) primarily evaluates the lateral semicircular canals, (2) provides less information regarding possible central pathology, (3) has limited insight into overall balance function (i.e. it does not evaluate visual inputs and balance adaptation), and (4) does not characterize deficits in terms of patient's functional status (i.e ability to stand).[5]

Videonystagmography (VNG) was used in this study. It is an objective way to evaluate and screen for a variety of vestibular disorders and is available in our local setting. Computerized Dynamic Posturography (CDP), a relatively newer test that assesses postural stability and tendency to fall has recently been introduced in our country. It has traditionally been used in the rehabilitation of patients suffering from dizziness.

Some studies[6,7] have shown the capacity of CDP in the treatment rehabilitation and assessment of patients with BPPV. Other authors [8,9] have correlated CDP and ENG in evaluating patients with dizziness.

In a previous study[10], patients with peripheral vertigo had 45% abnormal CDP using ENG as the gold standard; on the other hand, another study[11] suggested that 90% of those with peripheral vestibular disorder using VNG had abnormal CDP. Our purpose in undertaking this study was to determine the sensitivity, specificity, positive predictive value and negative predictive value of Computerized Dynamic Posturography in properly labeling patients diagnosed with peripheral vestibular disorders by VNG as having vestibular dysfunction in order to see if the above findings correlate well in the local setting.

METHODS

This was a retrospective study of records of patients with peripheral vestibular disorders and CDP and VNG results seen at the Institute of Neurosciences Hearing and Balance Center of St. Luke's Medical Center, Global City from 2007 to 2013. Data such as age, gender, type of dizziness, timing and duration of dizziness retrieved from previously-accomplished videonystagmography questionnaires in patient charts as well as VNG and CDP results were culled using MS Excel 2007 (v12.0) (Microsoft, Redmond, Washington, USA).

Records of patients aged 18 and above with no history of hypertension or cardiovascular diseases and no intake of anti-vertigo medications for at least 48 hours prior to testing and complete VNG and CDP results obtained on the same day or at least two days apart were included in the study.

Cases were defined as those diagnosed with a peripheral vestibular disorder by VNG while controls were defined as those with normal VNG results. Our goal was to consider only those with purely peripheral vestibular disorders as cases and therefore, those with hypertension and cardiovascular diseases were excluded. Only the Sensory Organization Test part of the CDP was used in this study.

Chi-square test was used to determine the difference between patient demographics with numerical values > 5. Fisher's Exact Test was used for values < 5. Epi Info™ Version 6 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA) was utilized. The sensitivity, specificity, positive predictive value and negative predictive value of CDP in labeling those with peripheral vestibular disorders as vestibular were determined using VNG as the gold standard.

RESULTS

Records of 23 patients meeting inclusion and exclusion criteria were included. Twelve (12) were male (52%) and 11 were female (48%). Their ages ranged from 21 to 82-years-old. There were 11 cases (4 males, 7 females) and 12 controls (8 males, 4 females).

Using Chi-square test, there was no significant difference between cases and controls with regards to age (P = 0.73; level of significance at 0.05), sex (P=0.24), pattern of dizziness (P=0.45) and duration of dizziness (P=0.18)

Using VNG as the gold standard for diagnosing Peripheral Vestibular Disorders, CDP had a sensitivity of 45.45% and specificity of 66.66% with PPV of 55.56% and NPV of 57.14%.

Interestingly, 33.33% (4/12) of patients with normal VNG had a vestibular dysfunction detected by CDP. *(Table I)*

Table 1. Patients with Dizziness based on VNG and CDP Results

Population	CONTROL			CASES		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
CDP Results						
Vestibular	0	0	0	1	0	1
Visual	2	0	2	0	1	1
Somatosensory	1	1	2	0	0	0
Visual and Vestibular	0	2	2	3	1	4
Visual, Vestibular and somatosensory	1	1	2	0	0	0
Normal	4	0	4	0	5	5

DISCUSSION

A study exploring the diagnostic value of CDP in assessing Peripheral Vestibular disorders using VNG by Zhang *et al.* found that 90% of those with Peripheral Vestibular Disorders had abnormal CDP.[11] This contrasts with the findings of Voorhees[10] that 45% of 112 peripheral cases of vertigo had abnormal results on CDP using Electronystagmography (ENG) as gold standard (assuming any abnormality detected by CDP to be a positive test). Despite our small sample size, our findings seem to confirm those of Voorhees[11] that CDP has a low 45% sensitivity in detecting a vestibular disorder if VNG is assumed to be the gold standard.

However, a significant number of patients (33.33%) presenting with normal VNG findings may actually have had a vestibular dysfunction perceived only by CDP. This finding may still suggest a role for CDP in diagnosing vestibular disorders.

We recognize the limitations of this study such as small sample size and the limitation of VNG as well disadvantages inherent in a retrospective approach.

We recommend future prospective studies with larger sample sizes utilizing VNG and CDP in order to verify our findings.

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