

# The importance of Epley maneuver in posterior canal benign paroxysmal positional vertigo

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**Abstract. – OBJECTIVE:** We investigated symptom scores and quality of life in unilateral posterior canal benign paroxysmal positional vertigo (BPPV) patients.

**PATIENTS AND METHODS:** In this retrospective and multicentric study, 78 patients with unilateral posterior canal BPPV (47 right-sided and 31 left-sided) were included. All patients have performed the Standard Epley maneuver. Features of the nystagmus [nystagmus duration (second), latent period (second)] and features of the disease [side (right or left-sided), disease duration (years), and recurrence of disease (present or absent)] were noted. Before and 1 week after the Epley maneuver, all patients were evaluated using the Vertigo Symptom Scale (VSS), Vertigo Dizziness Imbalance Symptom Scale (VDI-SS), and Vertigo Dizziness Imbalance health-related quality of life scale (VDI-HQoL).

**RESULTS:** Our results showed that VSSs of the right-sided group were significantly higher than those in the left-sided group before and 1 week after the maneuver ( $p<0.05$ ). One week after the maneuver, VDI-HQoLs of the left-sided group were significantly higher than those in the right-sided group ( $p<0.05$ ). In all right-sided and left-sided groups, at 1 week after the maneuver, VSSs were significantly lower, and VDI-SSs and VDI-HQoLs were significantly higher than those before the maneuver ( $p<0.05$ ).

As VSS values increased, VDI-SS and VDI-HQoL values decreased ( $p<0.05$ ). In the left-sided group, VSS values decreased, and VDI-HQoL values increased. As disease duration increased, VSS values increased before the maneuver ( $p<0.05$ ). In females, VSS values increased, and VDI-SS and VDI-HQoL values decreased before the maneuver ( $p<0.05$ ).

**CONCLUSIONS:** In posterior canal BPPV, the Epley maneuver effectively decreased VSS values and increased VDI-SS and VDI-HQoL values. In the left-sided BPPV group, there were lower VSS values and higher VDI-HQoL values that showed better quality of life of the patients. Older age and female gender are other factors related to lower quality of life with higher symptom scores.

*Key Words:*

BPPV, Side, Vertigo Symptom Scale (VSS), Vertigo Dizziness Imbalance Symptom Scale (VDI-SS), Vertigo Dizziness Imbalance health-related quality of life scale (VDI-HQoL).

## Introduction

Benign paroxysmal positional vertigo (BPPV) is an abnormal movement triggered by specific, crucial-provoking circumstances. The provocative situations often induce eye movements (nystagmus). The type and direction of the nystagmus are influenced by the compromised inner ear structure and underlying pathology<sup>1</sup>.

Involuntary eye movements, or nystagmus, are often induced by stimulating the inner ear. Typically, it begins with a gradual chase motion and transitions into a quick resetting phase. The nomenclature of nystagmus is contingent upon the rapid phase of the eye movement. It can be classified as right-beating, left-beating, up-beating, down-beating, or direction-changing nystagmus<sup>1</sup>.

When comparing the head-roll technique to the head-bending and lying-down positional tests for detecting lateral canal BPPV, Yetiser and Ince<sup>2</sup> found that the head-roll method was the most accurate. The head-roll technique successfully identified the afflicted side in 75% of patients with apogeotropic nystagmus and 95.6% with geotropic nystagmus, according to a study<sup>2</sup> of 78 people with lateral canal BPPV.

Clinically, patients with BPPV often experience one of two subtypes: posterior canal BPPV (also called horizontal canal BPPV) or lateral semicircular canal BPPV. About 85-95% of occurrences of BPPV occur in the posterior canal, making it more prevalent than horizontal canal BPPV<sup>3-6</sup>. Canalithiasis, in which fragmented otolith particles

(otoconia) enter the posterior canal and become displaced, causes inertial changes to the cupula in the posterior canal and leads to abnormal nystagmus and vertigo when the head encounters motion in the plane of the affected semicircular canal. This condition is widely believed<sup>7</sup> to be the cause of posterior canal BPPV. Only 5-15% of patients have BPPV in the lateral (horizontal) canal<sup>5,6</sup>.

Two key moves were devised concurrently to illustrate particle repositioning. These include the Epley and Semont maneuvers. The Semont maneuver consists of quick, powerful side-to-side motions of the head and body<sup>1</sup>.

Patients with BPPV experienced that therapy improves their quality of life<sup>8</sup>. Patients with unilateral posterior canal BPPV were studied, and their symptom levels and quality of life were evaluated.

## Patients and Methods

The Otolaryngology Departments of Nişantaşı University, Eskişehir Osmangazi University, Kırıkkale University, and Bilecik Şeyh Edebali University conducted this retrospective and multicentric study following the principles indicated in the Declaration of Helsinki. The study was performed after the clearance of the T.R. Bilecik Şeyh Edebali University, Non-Invasive Clinical Research Ethics Committee (Date: 05.12.2023, Number: 8/5). Acquiring informed permission was not required because the data were analyzed retrospectively.

### Subjects

This retrospective analysis comprised 78 individuals with unilateral posterior canal BPPV<sup>9</sup>, 47 of whom had right-sided BPPV and 31 left-sided BPPV. The Committee for Classification of Vestibular Disorders of the Bárány Society<sup>9</sup> examined the diagnostic criteria for benign paroxysmal positional vertigo (BPPV). Patients were randomly chosen from those who had applied to Baypark Hospital's Otolaryngology Clinics. In all cases, the standard Epley maneuver was performed. Patients' ages ranged from 28 to 72, with a mean of 49.64±9.43 years old.

Nystagmus characteristics (nystagmus duration in seconds, latent period in seconds) and illness characteristics (right or left side, years of disease, recurrence of disease) were recorded.

### Inclusion Criteria

Patients with unilateral posterior canal BPPV (right-sided or left-sided)<sup>9</sup>

### Exclusion Criteria

Patients with horizontal canal BPPV<sup>9</sup>  
Bilateral posterior canal BPPV patients  
Patients who did not come for 1-week after maneuver follow-up

### Methods

Before and 1 week after the Epley maneuver, all patients were evaluated using the Vertigo Symptom Scale (VSS), Vertigo Dizziness Imbalance Symptom Scale (VDI-SS), and Vertigo Dizziness Imbalance health-related quality of life scale (VDI-HQoL)<sup>10</sup>.

### Statistical Analysis

The data collected in this study were analyzed using the SPSS for Windows 16.0 software (SPSS Inc., Chicago, IL, USA). Mann-Whitney U test, Wilcoxon signed ranks test, independent samples *t*-test, Chi-square test, Spearman's correlation rho efficient test, and Pearson's correlation test were used.

A value of  $p < 0.05$  was considered statistically significant.

## Results

The number of people diagnosed with posterior canal BPPV was 30 in men and 48 in women. There were 16 men (34.0%) and 31 females (66.0%) in the right-sided BPPV group. There were 14 men (45.2% of the total) and 17 women (54.8% of the total) diagnosed with left-sided BPPV ( $p = 0.323$ ,  $\chi^2$ : 0.976).

### Nystagmus and Disease: Key Characteristics

Patients with BPPV ranged from 47 on the right side to 31 on the left.

Table I shows that the average duration of nystagmus for right- and left-eye sufferers are 19.48±9.50 seconds and 22.38±11.00 seconds, respectively ( $p > 0.05$ ). The mean latent time for right-sided nystagmus was 3.591.90 seconds and the mean latent period for left-sided nystagmus was 3.41±2.07 seconds ( $p > 0.05$ ). The median age at which patients died due to their disease was 1.78±0.95 years in the right-sided group and 1.96±0.91 years in the left-sided group ( $p > 0.05$ ).

Seven (14.9%) patients in the right-sided group and five (16.1%) individuals in the left-sided group experienced illness recurrence (Table I;  $p > 0.05$ ).

**Table I.** Evaluation results of the maneuvers according to the BPPV side.

		Right-sided (n=47)			Left-sided (n=31)			p
		Mean	Median	Std.Dev.	Mean	Median	Std.Dev.	
Nystagmus duration (s)*		19.48	15.00	9.50	22.38	25.00	11.00	0.421
Latent period (s)*		3.59	3.00	1.90	3.41	3.00	2.07	0.423
Disease Duration* (years)		1.78	1.00	0.95	1.96	2.00	0.91	0.308
VSS	Before Maneuver*	24.93	24.00	8.40	20.32	19.00	9.04	0.011
	After Maneuver-1 <sup>st</sup> week* p**	8.617	5.00 0.000	11.40	4.58	2.00 0.000	6.69	0.002
VDI-SS	Before Maneuver***	27.97	31.00	10.02	30.25	29.00	11.15	0.408
	After Maneuver-1 <sup>st</sup> week* p**	63.02	66.00 0.000	8.52	63.25	67.00 0.000	9.16	0.485
VDI-HQoL	Before Maneuver*	64.76	64.00	20.88	72.22	81.00	19.64	0.093
	After Maneuver-1 <sup>st</sup> week* p**	91.61	93.00 0.000	12.67	97.74	100.00 0.000	10.68	0.034
		<b>n</b>		<b>%</b>	<b>n</b>		<b>%</b>	<b>p****</b>
Recurrence	Present	7		14.9	5		16.1	p=0.883 χ <sup>2</sup> : 0.022
	Absent	40		85.1	26		83.9	

BPPV: Benign paroxysmal positional vertigo, VSS: Vertigo Symptom Scale, VDI-SS: Vertigo Dizziness Imbalance Symptom Scale, VDI-HQoL: Vertigo Dizziness Imbalance health-related quality of life scale. \*p-value indicates the results of Mann-Whitney U test. \*\*p-value indicates the results of Wilcoxon signed ranks test. \*\*\*p-value indicates the results of independent samples t-test. \*\*\*\*p-value indicates the results of the results of Chi-square test.

**Evaluation Results for the Maneuvers According to the BPPV Side**

The right-sided group’s VSSs were greater both before and during the first week following the procedure (p<0.05). Table I shows that one week following the maneuver, both right and left-sided groups’ VSSs were considerably lower than their values before the procedure (p<0.05).

Before and throughout the first week following the procedure, there were no statistically significant differences (p>0.05) between the right- and left-sided groups’ VDI-SSs. First-week post-maneuver VDI-SSs were statistically greater than pre-maneuver values in both the right- and left-sided groups (p<0.05; Table I).

The VDI-HQoLs of the left-sided group were greater than those of the right-sided group one week after the procedure (p<0.05). Table I shows that the VDI-SSs one week after the right-sided and left-sided maneuvers were substantially more significant than their respective pre-maneuver values (p<0.05).

**Evaluation Results of the Maneuvers Between Before and 1 Week After the Maneuver in All Groups**

The VSSs were considerably reduced, and the VDI-SSs and VDI-HQoLs were significantly increased one week after the maneuver compared to the values before the operation (p<0.05; Table II).

**Table II.** Evaluation results of the maneuvers between before and 1st-week after the maneuver in all groups.

	Before Maneuver (n=78)			After Maneuver-1 <sup>st</sup> week (n=78)			p*
	Mean	Median	Std.Dev.	Mean	Median	Std.Dev.	
Vertigo Symptom Scale	23.10	20.00	8.90	7.01	4.00	9.95	0.000
Vertigo Dizziness Imbalance Symptom Scale	28.88	29.50	10.47	63.11	66.00	8.72	0.000
Vertigo Dizziness Imbalance health-related quality of life scale	67.73	69.00	20.60	94.05	96.50	12.22	0.000

\*p-value shows the results of Wilcoxon signed ranks test.

**Correlation Test Results**

Before the procedure and one week later, patients with higher VSS values reported better VDI-SS and VDI-HQoL scores ( $p<0.05$ ) (Table III).

VSS values decreased, and VDI-HQoL values increased one week after the maneuver in the patients with the left-directed nystagmus group ( $p<0.05$ ) (Table III).

As disease duration increased, VSS values increased before the maneuver ( $p<0.05$ ) (Table III).

In older patients, VDI-HQoL values decreased before the maneuver ( $p<0.05$ ) (Table III).

In females, VSS values increased, and VDI-SS and VDI-HQoL values decreased before the maneuver ( $p<0.05$ ) (Table III).

**Discussion**

Eighteen percent of those who seek medical attention for dizziness are found to have BPPV. The lifetime prevalence of this illness is 2.4%,

whereas the 1-year prevalence rate is 0.6%<sup>11</sup>. The frequent cause of vertigo, benign paroxysmal positional vertigo (BPPV), has a negative impact on patients' ability to perform their daily life activities. Posterior canal BPPV (PC-BPPV) begins in the posterior semicircular canal<sup>12-16</sup>. When treating PC-BPPV, the Epley technique is a highly effective option<sup>17</sup>. Moreover, the self-Epley maneuver may be more effective than the Brandt-Daroff exercise, as suggested by Radtke et al<sup>18</sup>.

Posterior semicircular canal BPPV (PC-BPPV), lateral semicircular canal BPPV (LC-BPPV), and superior semicircular canal BPPV (SC-BPPV) are all subtypes of BPPV based on which semicircular canal is involved. Eighty to ninety percent of cases are classified as PC-BPPV<sup>19,20</sup>, followed by LC-BPPV (10-20%) and SC-BPPV (about 5%). The anatomical orientation of the LC causes the symptoms of LC-BP-PV, which include severe rotational vertigo and nystagmus when the head or torso is twisted when laying down<sup>21</sup>.

**Table III.** Correlation tests.

			VSS		VDI-SS		VDI-HQoL	
			Before Maneuver	After Maneuver-1 <sup>st</sup> week	Before Maneuver	After Maneuver-1 <sup>st</sup> week	Before Maneuver	After Maneuver-1 <sup>st</sup> week
VSS	Before Maneuver	r	0.576	-0.699	-0.406	-0.588	-.442	
		p*	0.000	0.000	0.000	0.000	.000	
	After Maneuver-1 <sup>st</sup> week	r	0.576	-0.257	-0.719	-0.142	-.593	
		p*	0.000	0.023	0.000	0.216	.000	
VDI-SS	Before Maneuver	r	-0.699	-0.257	0.309	0.653	.306	
		p*	0.000	0.023	0.006	0.000	.006	
	After Maneuver-1 <sup>st</sup> week	r	-0.406	-0.719	0.309	0.213	.687	
		p*	0.000	0.000	0.006	0.061	.000	
VDI-HQoL	Before Maneuver	r	-0.588	-0.142	0.653	0.213	.471	
		p*	0.000	0.216	0.000	0.061	.000	
	After Maneuver-1 <sup>st</sup> week	r	-0.442	-0.593	0.306	0.687	0.471	
		p*	0.000	0.000	0.006	0.000	0.000	
Disease side (Code 1: Right-sided, Code 2: Left-sided)	Nystagmus duration (s)	r	-0.291	-0.345	0.101	0.080	0.192	0.241
		p*	0.010	0.002	0.377	0.489	0.093	0.033
Latent period (s)		r	0.076	0.014	0.016	0.061	0.064	-0.017
		p*	0.511	0.905	0.890	0.593	0.575	0.881
Disease Duration		r	0.103	-0.096	0.095	0.167	-0.167	0.009
		p*	0.368	0.402	0.407	0.144	0.145	0.941
Recurrence (Code 0: None, Code 1: Present)	Age	r	0.265	0.174	-0.053	-0.043	-0.149	-0.222
		p*	0.019	0.127	0.646	0.707	0.194	0.051
Gender (Code 1: Male, Code 2: Female)		r	0.039	0.223	-0.174	-0.154	0.006	-0.167
		p*	0.736	0.050	0.128	0.178	0.956	0.143
		r	0.147	0.133	-0.156**	-0.115	-0.274	-0.157
		p*	0.198	0.244	0.173**	0.315	0.015	0.171
		r	0.378	0.221	-0.247	-0.146	-0.423	-0.168
		p*	0.001	0.052	0.029	0.202	0.000	0.141

VSS: Vertigo Symptom Scale, VDI-SS: Vertigo Dizziness Imbalance Symptom Scale, VDI-HQoL: Vertigo Dizziness Imbalance health-related quality of life scale. \*p-value shows the results of Spearman's correlation rho efficient test. \*\*p-value shows the results of Pearson's correlation test.

There were 47 cases of right-sided BPPV and 31 cases of left-sided BPPV in this analysis. The average duration of nystagmus in the right-sided group was 19.489.50 seconds, whereas in the left-sided group, it was 22.3811.00 seconds. Latent periods for nystagmus were  $3.59 \pm 1.90$  seconds in the right-sided group and  $3.41 \pm 2.07$  seconds in the left-sided group. The right-sided group's VSSs were greater before and during the first week following the procedure compared to the left-sided group's VSSs. There was a statistically significant difference between the VDI-HQoLs of the left- and right-sided groups one week following the procedure. In the 1<sup>st</sup> week post-maneuver, VSSs were considerably reduced in both the right- and left-sided groups, but VDI-SSs and VDI-HQoLs were significantly greater.

Inversely, while VSS rose, VDI-SS and VDI-HQoL decreased. The VSS levels diminished, and the VDI-HQoL values increased in the left-side group. The pre-manipulation VSS levels rose as the illness progressed. Before the procedure, women's VSS scores increased, while the VDI-SS and VDI-HQoL scores decreased.

Similar improvements were reported by Kar and Altıntaş<sup>10</sup>, who also used the Epley maneuver to treat vertigo using the Vertigo Symptom Scale, the Vertigo Dizziness Imbalance Symptom Scale, and the Vertigo, Dizziness Imbalance health-related quality of life scale. Our study compared patients with right- and left-sided BPPV and found that those with left-sided BPPV had lower VSS values and higher VDI-HQoL values.

According to research by Power et al<sup>22</sup>, two canalith repositioning procedures helped treat 88% of cases of horizontal canal BPPV and 91% of patients of posterior canal BPPV. Bilateral posterior canal BPPV, multiple canal BPPV, and canal conversion all resulted in a greater number of treatments needed<sup>22</sup>.

The self-Epley and Epley techniques were evaluated for their ability to alleviate posterior canal benign paroxysmal positional vertigo (PC-BPPV) symptoms by Kulthaveesup and Bunnag<sup>23</sup>. In the self-Epley maneuver group, 29 of 32 (90.62%) patients were healed after 1 week, whereas in the Epley maneuver group, 28 of 32 (87.50%) patients were cured. Patients who are unable to attend a hospital or who must remain in quarantine owing to COVID-19 may benefit from performing the self-Epley technique twice a day, as documented. To achieve satisfactory outcomes through self-Epley maneuvers, it is imperative to acquire proficiency in the correct technique.

Treatment effectiveness of the Gufoni-Appiani and head-shaking techniques for apogeotropic LC-BPPV was evaluated in a randomized, prospective, sham-controlled research by Kim et al<sup>24</sup>. Patients were followed up weekly for a month following the initial Gufoni-Appiani (n=52), head-shaking, or sham maneuver (n=51) treatment. The cumulative therapeutic advantages of the Gufoni-Appiani ( $p < 0.001$ ) and head-shaking procedures were significantly higher than those of the sham maneuver ( $p = 0.026$ ).

## Conclusions

Epley technique<sup>25</sup> reduces VSS values and elevates VDI-SS and VDI-HQoL in posterior canal BPPV<sup>26,27</sup>. Patients' quality of life was better in the left-sided group, as measured by both the VSS and the VDI-HQoL, which were lower in that group. Lower quality of life and increased symptom ratings have also been linked to being older and being a woman.

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## Conflict of Interest

All the authors declare no conflict of interest.

## Ethics Approval

Ethics committee approval was taken from T.R. Bilecik Şeyh Edebali University, Non-Invasive Clinical Research Ethics Committee (Date: 05.12.2023, Number: 8/5).

## Informed Consent

There was no need for informed consent because the data were evaluated retrospectively.

## Authors' Contributions

Zeynel Öztürk: Planning, designing, literature survey, data collection, active intellectual support.

Nuray Bayar Muluk: Planning, designing, literature survey, statistical analysis, writing, active intellectual support, submission.

Rıza Dünder: Planning, designing, literature survey, active intellectual support.

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**Availability of Data and Materials**

All data for this study are presented in this paper.

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