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Effect of Epley maneuver versus Semont maneuver on vertigo in post-menopausal women

Emad Eldin Mohamed Abdelatief *; Radwa Mohammed Yehia[1]

**Department of Basic Science, Faculty of Physical Therapy, October 6 University, Egypt*
Telephone: 0201146808839, Email: emad9111@live.com
[1] Department of Physical Therapy for Gynecology and Obstetrics, Faculty of Physical Therapy, October 6 University, Egypt

Abstract

Background: *Benign Paroxysmal Positional Vertigo (BPPV) is one of the most common causes of dizziness and vertigo that arising from a problem in the inner ear. The frequency of vertigo lasts less than one minute with a symptom of a spinning sensation, vomiting and difficulty of walking when the head is changed to a certain position. This may be because of the collection of calcium crystals that has high sensitivity to head positions in one of the semicircular canals. BPPV can be treated by several maneuvers; Epley and Semont are one of them. These maneuvers can correct the position of posterior canal.*
Objective: *The purpose of this study was to compare the effect of Epley and Semont maneuvers on vertigo in Post-menopausal women*
Material and methods: *Sixty post-menopausal women with unilateral posterior canal BPPV based on Dix-Hall pike test participated in this study. Their ages ranged from 45 to 60 years. They were assigned into two groups; group A received Epley maneuver and group B received Semont maneuver.*
Outcome measures: *Visual vertigo analogue scale (VVAS) for vertigo intensity and Videonystagmography (VNG) for nystagmus duration.*
Results: *There was no statistically significant difference between both groups in post-treatment measurements of the nystagmus duration with a significant difference in vertigo intensity.*
Conclusions: *Both maneuvers can be applied to control symptoms of Benign Paroxysmal Positional Vertigo with a significant reduction in favor to Epley maneuver group.*

Keywords: *Benign Paroxysmal Positional Vertigo, Epley maneuver, Semont maneuver, Visual vertigo analogue scale, Videonystagmography*

Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is caused by a problem in the inner ear. It occurs when tiny calcium "stones or crystals" inside the inner ear canals that help to keep the balance of the body stop to move. This makes the inner ear to sends false signals to the brain [1]. The brain deal with this false information as a spinning sensation, vertigo or difficulty of walking which normally lasts less than one minute. Some people who suffer from dizziness spells feel have no symptoms, while others feel a slight sense of imbalance [2].

The treatment of BPPV depends on the severity of the case and which canal(s) the crystals are in, and whether it is canalithiasis or cupulolithiasis. Surgical treatment is the only options in severe BPPV, while the repositioning of otoconia by mechanical correction of maneuvers is the other option in controlled cases [3]. The maneuvers help the crystals to move back to the chamber by using the force of the gravity and this has been assumed to be by a very specific series of head movements called Canalith Repositioning Maneuvers. In the case of cupulolithiasis, they would utilize rapid head movement in the plane of the affected canal to try to dislodge the 'hung-up' crystals first, called a Liberatory Maneuver, and then guide them out [4].

Epley maneuver is one of the maneuvers that can be used for repositioning of crystals away from the semicircular canal. Before treatment of BPPV, an accurate evaluation of head and neck should be done to determine the precautions in the

procedure of the maneuver. It can be applied several times in one treatment session until the patient feel symptom-free [5].

The Semont maneuver is another maneuver that used for the treatment of BPPV. It depends on the movement of the head into different positions firmly, the crystal debris (canaliths) causing vertigo moves freely and no longer causes symptoms [6].

The initial step in the Epley maneuver is the Dix Hall pike (DH) maneuver, a variation of which is also used in the Semont maneuver. This is useful in diagnosis because it places the patient's eyes in a favorable position for viewing by the physician and it is designed to trigger a particularly severe spell of nystagmus that is thus more easily observed [7].

The purpose of this study was to compare the effect of Epley and Semont maneuvers on vertigo in Post-menopausal women.

Material and methods

Patients

This study was conducted on sixty females with Post-menopausal women with unilateral posterior canal BPPV based on Dix-Hall pike test. They were collected from the Kasr Alainy Hospital from October 2016 to August 2017. Eligible females had provided informed consent for participation and for publication of the results. The study was approved by the ethical committee of the Faculty of Physical Therapy. Randomization was done by opening an opaque envelope prepared by an independent individual using random number generation. The patients were selected according to the following criteria:

Inclusion criteria

1) Their ages ranged from 45-60 years.
2) Post-menopausal women with unilateral posterior canal BPPV based on Dix-Hall pike test.
3) Medically stable and not under anti-motion sickness or anti-vertigo drugs.
4) Vertigo and nystagmus lasted less than 60 seconds recorded by VNG goggles.
5) Duration of the present episode not more than two months.

Exclusion criteria

1) Bilateral BPPV and anterior or horizontal or lateral canal involvement.
2) Involvement of more than one semicircular canal on the same side.
3) Females unable to tolerate the DH.
4) Females with cervical and trunk problem.

Design

All patients in this study were assigned randomly into two groups; group A received Epley maneuver and group B received Semont maneuver.

Intervention

All patients received treatment with Epely and Semont maneuvers by one maneuver per session per week for six weeks.

Epley maneuver:

1- The patient started in the long sitting with the head rotated 45 degrees to the affected side.
2- The patient next rapidly reclined to the supine position with the neck slightly extended. This position was held for 30 seconds, or until nystagmus and dizziness subside.
3- The patient's head was rotated 90 degrees to the opposite side. This position was held for 20 seconds, or until nystagmus and dizziness subside.
4- The patient's head was turned another 90 degrees, requiring the patient to go from the supine to side-lying position. This position was held for 20 seconds, or until dizziness and nystagmus subside.
5- The patient was brought up to the short-sitting position.

Semont maneuver:

1- The patient started in the short sitting position. The head was rotated 45 degrees towards the unaffected ear.
2- Examiner placed one hand under the down most shoulder while the other hand supported the neck
3- The patient rapidly was moved to side lying to the affected side (the face was oriented towards the ceiling). This position was held for 30 seconds.
4- Without any head movement, the patient was moved to side lying on the opposite side of the body (the face was oriented towards the bed). This position was held for 30 seconds.

Outcome Measures

1- **Vertigo intensity**

Visual vertigo analogue scale (VVAS): 0-10 cm line consists of 9 separate scales to rate the intensity of visual vertigo. Patients were asked to estimate the intensity of their symptoms on each scale. [8] The scale ranges from zero to ten, zero being the lowest level of dizziness and ten being the greatest. The Cronbach's Alpha index indicated the VVAS is internally consistent and reliable (Cronbach's Alpha=0.94). In the VVAS, symptom

severity is classified as mild when the score is between zero and three; moderate, between four and six; and severe, between seven and ten [9].

2- **Nystagmus duration**
Videonystagmography (VNG) is a computerized system that applied the principle of recording eye movements by using infrared sensors in special spectacles or masks. The computer software measures and analyzes eye movements, which may be presented on a video monitor and recorded.

All patients were assessed using VVAS to measure the intensity of vertigo episodes and videonystagmography device to measure nystagmus duration before treatment program and after six weeks of the program.

Statistical Analysis
Statistical analysis was conducted using SPSS for windows version 22 (SPSS, Inc., Chicago, IL). The current test involved two independent variables. The first one was the (tested group); between subject factors which had two levels (group A represent Epley maneuver and group B represent Semont maneuver). The second one was the (measuring periods); within-subject factor which had two levels (pre, post). In addition, this test involved two tested dependent variables (vertigo intensity and nystagmus duration). Prior to final analysis, data were screened for normality assumption, homogeneity of variance, and the presence of extreme scores. This exploration was done as a pre-requisite for parametric calculations of the analysis of difference.

Descriptive analysis using histograms with the normal distribution curve showed that vertigo intensity and nystagmus duration was not normally distributed and violate the parametric assumption for the measured dependent variable also after transformation the data, the data was still not normally distributed. Additionally, testing for the homogeneity of covariance revealed that there was a significant difference with p values of < 0.05. Normality test of data using Shapiro-Wilk test was used, that reflect the data was not normally distributed for vertigo intensity and nystagmus duration. All these findings allowed the researchers to conduct a non-parametric analysis. So, non-parametric statistical tests in the form of Wilcoxon Signed Rank tests were used to compare between pre- and post-treatment for each group and Mann-Whitney U-test was used to compare between both groups. The alpha level was set at 0.05.

Results
A total of 60 participants were included in the final data analysis**.** They have divided into two groups; group A consisted of 30 patients received Epley maneuver and the group B consisted of 30 patients received Semont maneuver. The independent t-test revealed that there were no significant differences ($p>0.05$) in the mean values of age, body mass, and height between both tested groups (table 1).

Table (1): Demographic characteristics of patients in both groups:

Characteristics	Group A (n =30)	Group B (n =30)	*t-value*	*P*-value
Age (years)	54.2±4.52	55.26±3.70	-0.999	0.322
Body mass (Kg)	85.13±2.93	86.06±1.48	-1.555	0.125
Height (cm)	166.26±2.42	167.13±1.73	-1.594	0.116

*Significant level is set at alpha level <0.05.

Regarding within group's comparison, statistical analysis using Wilcoxon Signed Rank tests revealed that there was a significant reduction in vertigo intensity and nystagmus duration at post-treatment in comparison to pre-treatment at both groups with ($p < 0.05$). Table (2) present descriptive statistic (median and Interquartile Range) and comparison tests (within and between groups) for all dependent variables. Considering the effect of the tested group (first independent variable) on vertigo intensity, "Mann-Whitney U-test" revealed that there was significant difference between both groups at post-treatment ($p<0.05$) and this significant reduction in favor to group A. While, Considering the effect of the tested group (first independent variable) on nystagmus duration, "Mann-Whitney U-test" revealed that there was no significant difference between both groups at post-treatment ($p>0.05$).

Table (2): Descriptive statistics for the all dependent variables for both groups at different measuring periods.

	Group A median (IQR)		Group B median (IQR)	
Variables	Pre	Post	Pre	Post
Vertigo intensity	6.4 (1.27)	1.5 (0.82)	6.8 (1.22)	2.25 (1.27)
Nystagmus duration	25 (1)	1 (1)	25 (2.25)	2 (2)
Within groups (Pre- Vs. post) Wilcoxon Signed Rank tests				
p-value	Vertigo intensity		Nystagmus duration	
Group A	0.0001*		0.0001*	
Group B	0.0001*		0.0001*	
Between groups (group A Vs. group B) Mann-Whitney U-test				
p-value	Vertigo intensity		Nystagmus duration	
Pre-treatment	0.258		0.105	
Post-treatment	0.04*		0.123	

*Significant at the alpha level ($p < 0.05$), IQR: Interquartile Range.

Discussion

This study was conducted to compare the effect of Epley and Semont maneuvers on vertigo in Post-menopausal women. The age of the women included in this study ranged from forty-five to sixty years. The results of this study showed a significant reduction in vertigo intensity and nystagmus duration in both groups.

The results of group A is supported by Marchiori et al. 2011 who conducted a study of a series of 9-month long cases of five female individuals aged between 46 and 64 years with BPPV. These females (with positive DH) were submitted to Epley maneuver and evaluations were repeated in a six and nine-month term. Four patients required only one therapeutic maneuver to eliminate nystagmus and positional vertigo and did not show a positive DH in the two reevaluations performed. Only one patient required a second session to full resolution of BPPV.

Moreover, Clinch et al. 2010 reported that Epley maneuver should be the first line of treatment in the elderly suffering from BPPV by several good qualities randomized controlled trials. A double-blind study done by Von-Brevern et al. 2006 with 67 patients reported an improvement in vertigo intensity and nystagmus duration at 24 hours among 80% of patients treated with Epley maneuver, compared with 10% of those who received a sham maneuver. Another randomized controlled trial done by Tanimoto et al. 2005 enrolled 80 participants found the complete resolution of BPPV symptoms one week after treatment in 88% of patients who received Epley maneuver plus self-treatment (a modified Epley maneuver) compared with 69% who received Epley maneuver alone.

Epley maneuver is considered as a simple effective treatment [12] and according to a study done by Macias et al. 2000, 240 posterior canal BPPV patients treated by Epley maneuver and maneuver repeated at the same visit until treatment success was achieved or patient fatigue persisted treatment continuation. Patients cured by 1st visit were 186 (77.5%) and 40 (16.6%) patients needed for the 2nd visit, 11 (4%) patients cured by the 3rd session and only one patient required five visits.

The Semont maneuver depends on the rapid movement of the patient's head from lying on one side to lying on the other [11]. Obrist et al. (2016) suggest that the head should be extended beyond the horizontal by about 10 degrees, on both sides to reduce movement of otoconia toward the cupula that result in failure of the maneuver. The explanation for this suggestion may be due to the movement of the debris or "ear rocks" out of the sensitive part of the ear (posterior canal) to a less sensitive position [19].

Cohen and Kimball 2005 demonstrated that either Epley or Semont maneuvers decreased the intensity of visual vertigo more than a sham maneuver and both maneuvers were more effective than Brandt-Daroff maneuver. Radtke et al. 2004 compared the efficacy of a self-applied modified Semont maneuver (MSM) with self-treatment with a modified Epley procedure (MEP) in 70 patients with posterior canal benign paroxysmal positional vertigo. The result of their study revealed that the response rate after 1 week was the absence of positional vertigo and

torsional/up beating nystagmus on positional testing, by 95% in the MEP group (n = 37) vs 58% in the MSM group (n = 33; p 0.001).

The Improvement of vertigo intensity and nystagmus duration in both groups may be related to a) The movement of otoconia from semicircular canals to a less sensitive location within the inner ear, b) Allowing free-floating particles from the affected semicircular canal to be relocated, using gravity, back into the utricle. [20,21], c) Waiting five to ten minutes after application of each maneuver before going home to avoid vertigo and dizziness as the otoconia reposition after the maneuver immediately [22].

Conclusion:

The treatment of BPPV with Epley or Semont maneuvers appeared to reduce nystagmus and vertigo intensity. Both maneuvers can provide an applicable and rapid way for control symptoms.

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Conflict of interest

The authors have no conflicts of interest to disclose.

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