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Combined Epley and Semont Maneuver in Benign Paroxysmal Positional Vertigo

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ABSTRACT

Introduction
Benign paroxysmal positional vertigo is defined as a short, episodic, transient vertigo caused by changes in the position of the head.

Objectives
In this study, the effects of combined Epley and Semont maneuvers were investigated in patients with vertigo who were detected with some pathology in the posterior semicircular canal.

Methods
This prospective study, which was conducted between December 2016 and January 2018 at our clinic, included 196 patients with a typical history and positive Dix-Hallpike test with Videonystagmography (VNG). The patients were randomized into three groups as those who were subjected to the Epley, Semont or combined maneuvers. The patients were reevaluated after the first day, first week and first month following the maneuver. Evaluation of treatment response was based on the VNG test.

Results
Treatment rates of the Epley Group patients were 69.35% on the first day, 75.80% after the first week and 85.48% after the first month. The treatment rates of the Semont Group patients were found to be 63.26% on the first day, 75.51% after the first week and 81.63% after the first month. On the other hand, the treatment rates of the combined group patients were 85.88% on the first day, 90.58% after one week and 95.29% after one month. The treatment rate registered with the combined maneuver was found to be significantly higher than those in the Epley Group and the Semont Group ($\chi^2 = 6.685$, $p<0.05$; $\chi^2 = 6.346$, $p<0.05$). Six months after recovery, recurrence was registered in four patients in the Epley Group (6.4%) and five patients in the Semont Group (10.2%).

Conclusion
The results show that utilization of combined maneuvers in our study increased the success rate.

Keywords
Vertigo; Maneuver; Videonystagmography (VNG).

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is defined as a short, episodic, transient vertigo caused by changes in the position of the head.[1] The most commonly observed reason is peripheral vestibular system disease.[2-4] It is observed two-fold in women in comparison to men and most commonly in the 5th and 6th decades of life.[5]

Although benign paroxysmal positional vertigo affects all three semicircular canals, the most commonly involved one is the posterior canal.[6,7] It is very important to identify which canal is involved in determining the treatment to be administered. The Dix-Hallpike test is used to detect posterior canal involvement, while the roll or Pagnini-McClure maneuver is used to detect horizontal (lateral) canal involvement.[7,8]

Patients diagnosed with benign paroxysmal positional vertigo are frequently treated with repositioning maneuvers.[1-4] The most commonly used one, the Epley maneuver is based on the

canalithiasis theory, whereas the other commonly used a maneuver, the Semont maneuver is based on the cupulolithiasis theory.[5,7,8]

In this study, we aimed to investigate the efficacy of treatment success of the combination of the Epley and Semont maneuvers, which are the two most commonly used maneuvers in patients who present with positional vertigo who were diagnosed with pathology in the posterior semicircular canal.

MATERIALS AND METHODS

A total of 196 patients (83 males, 113 females, mean age of 52.6±8.5-years, range of 19 to 66 years) who visited our ear-nose-throat (ENT) outpatient clinic between December 2016 and January 2018 with complaints of dizziness who were diagnosed with posterior canal benign paroxysmal positional vertigo (BPPV) were enrolled in this prospective randomized comparative study. The study protocol was approved by the Bakırköy Sadi Konuk Research and Training Hospital Ethical Committee (Protocol No. 2016-129). All patients in the study provided written informed consent to confirm their voluntary participation.

Patients with non-posterior canal or bilateral canal involvement, those using ototoxic and tranquilizing drugs, those who could not tolerate the Dix-Hallpike test, those suspected of having central nervous system (CNS) disorders, patients with vestibular system diseases other than BPPV such as Meniere's disease, postural hypotension, chronic otitis media, perilymph fistula, labyrinthitis and vestibular neuritis were excluded from the study.

Videonystagmography equipment (VNG, Micromedical Technologies INC., Chatham, USA) was used in our study. Individuals who were to be tested for VNG were asked not to use any sedative drugs or take alcohol within 48 hours prior to the test. For a healthy recording, any makeup around the eyes was cleaned before the test. A quiet, dimly lit room and a quiet environment were preferred for the test to avoid distracting the patient. Dynamic positional tests (the Dix-Hallpike maneuver and roll maneuver) were performed together with VNG. The images were recorded. Observation of torsional nystagmus that lasted for less than 30 seconds clockwise when the left ear was below, unlike anti-clockwise, after 10-15 seconds of latency when the right ear was underneath; observation of torsional nystagmus in the reverse direction when the patient was brought to a sitting position; slowing and disappearance of the nystagmus when the maneuver was repeated and observation of concomitant vertigo with nystagmus, were considered as indicators of posterior canal BPPV. The absence of horizontal canal BPPV after the roll test was also confirmed.

Treatment was performed randomly by the same specialist with the Epley maneuver in one group (Epley group) and the Semont maneuver in another group (Semont group). The combined maneuvers were applied to the last group (combination group). In other words, the Semont maneuver was performed on the pathology side of the patient immediately after the Epley maneuver (Figure 1A-1G).

Figure 1A-1G: *The Epley Maneuver was Initiated for the Left Side. E-at the End of the Epley Maneuver, the Patient was Laid on the Opposite Side, with the Face Immediately Facing Upwards While Seating. F- the Patient was Laid on the Other Side without Changing the Position of the Head. At this Moment, their Face was Facing Downwards. G- the Patient was Lifted Up and the Maneuver was Terminated*

The combined maneuver was also suspended from the examination table by turning the patient's head 45 degrees to the lesion side and providing a 30-degree extension position. The head was then rotated 90 degrees to the opposite side of the lesion, maintaining the head in the extended position. The patient was then rotated 90 degrees to the opposite side of the lesion alongside with the head and the body and positioned in a face-down position with an angle of 135 degrees from the supine position. The patient was later laid down to the opposite side without changing the position of the head. At this moment the face was looking upwards. The patient was then swiftly put in a sitting position and immediately laid onto the other side. At this moment, the face was looking downwards. Lastly, they were slowly brought to an upright position, and the head was brought to a slight flexion position. Two minutes were spent in all the positions.

No aggravation technique or sedative premedication was administered during the procedure. After the patients were subjected to the maneuvers, they were informed about avoiding excessive physical exercise and sudden head movements for a week and told not to lie on the side of canal involvement. No drug treatment was administered after the procedure.

The patients were reevaluated after the first day, first week and the first month after the maneuver. The VNG test was considered as the basis for evaluating treatment response. The patients who did not develop vertigo and nystagmus were reported to have recovered, whereas those who developed such conditions were considered to not have responded to treatment. These patients were subjected to the same maneuvers. The patients were contacted in the sixth month, and findings were obtained on whether or not they had a repeated vertigo attack during this period.

Statistical analysis was performed using the PASW 19.0 version software (SPSS Inc., Chicago, IL, USA). Standard deviation (SS) was used for variables determined by measurement, whereas percentage (%) value was used for variables determined by counting. Wilcoxon signed-rank test was used for intra-group comparison of parameters of the abnormal distribution. A value of $p < 0.05$ was considered statistically significant.

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RESULTS

Clinical and demographic data of the patients are shown in Table 1. Comparison of the groups with regards to age demonstrated a similarity among all three groups (p=0.554). Comparison of the groups with regards to sex demonstrated that all three groups were similar (p=0.796).

Table 1. *Clinical and Demographic Data of the Patients*

Affected side (right/left)	1/1.5
Vertigo presentation duration (days)	6.2±10.3
Sex	
Male	83
Female	113
Etiology	Trauma 21.9%, idiopathic 78.1%
First vertigo attack	72%

The treatment rates of the 62 Epley group patients who were subjected to the Epley maneuver were found to be 43/62 (69.35%) on the first day, 47/62 (75.80%) after one week and 53/62 (85.48%) after one month. The group recovery rates of the patients are shown in Table 2.

Table 2. *Group Recovery Rates*

	1st Day	1st Week	1st Month
Epley Group (n=62)	43/62 (69.35%)	47/62 (75.80%)	53/62 (85.48%)
Semont Group (n=49)	31/49 (63.26%)	37/49 (75.51%)	42/49 (81.63%)
Combined Group (n=85)	73/85 (85.88%)	77/85 (90.58%)	81/85 (95.29%)

Treatment rates of the 49 Semont group patients subjected to the Semont maneuver were 31/49 (63.26%) on the first day, 37/49 (75.51%) after one week and 42/49 (81.63%) after one month.

The treatment rates of the 85 Combined Group patients treated with the combined maneuver were found to be 73/85 (85.88%) on the first day, 77/85 (90.58%) after one week and 81/85 (95.29%) after one month.

The treatment rate in the combined group was found to be significantly higher than that in the Epley and Semont groups (χ^2=6.685, p<0.05; χ^2=6.346, p<0.05).

Six months after recovery, recurrence was reported in four patients in the Epley Group (6.4%) and five patients in the Semont Group (10.2%). However, no recurrence was observed in the Combined Group (0%).

Subsequent evaluation showed that there was no other maneuver-related canal escape or canal obstruction in any of the patients. Lower back pain was reported in one patient in the Epley group and in three patients in the combined maneuver group. Successful treatment was achieved with oral non-steroidal anti-inflammatory drug therapy.

DISCUSSION

Symptoms of BPPV are characterized by brief and severe episodes of dizziness, which may be frightening and very disturbing for the patient, caused by movements of the head against gravity. These are explained by the most current and widely accepted "*cupulolithiasis*" and "*canalithiasis*" theories. The definition of cupulolithiasis was first introduced by Schuknecht, who demonstrated that otoconia adhering to the cupula made the cupula susceptible to gravity, with resulting development of nystagmus and vertigo.[9] The Semont maneuver, which was developed in association with the cupulolithiasis theory, is based on the theory that otoconia in the cupula break free from their adhering positions following rapid head movements.[3,8,10] On the other hand, the most widely accepted "*canalithiasis*" theory is based on the notion that otoconia do not adhere to the cupula but actually move freely in the endolymph. Together with head movements, the particles initiate movement through the endolymph by piston action. As a result of this movement, the cupula is stimulated, causing the development of vertigo attacks.[11] The Epley maneuver, which is based on the canalithiasis theory, was developed to have these otoconia to fall back into the vestibule.[8] Better results that are obtained with the Epley maneuver in the treatment of BPPV have over the time led to consideration of the cupulolithiasis theory as invalid and attempts made in the application of canalithiasis treatment in all patients. However, studies have shown that the cupulolithiasis theory is still valid, and both methods demonstrate success in BPPV.[11-13] In our study, we aimed to investigate the effects of combining both maneuvers on treatment success.

This is a test based on recording eye movements created with visual or caloric stimuli with infrared video cameras by wearing spectacles with special recording apparatus without using VNG electrodes.[14] It is helpful in identifying unilateral/bilateral vestibular function deficits, confirming the diagnosis of BPPV, and in the differential diagnosis of central pathologies which are not easily distinguished with clinical examination.[15] In our study, we performed dynamic position tests with VNG in order to maintain objective criteria. As a result, all non-posterior canal pathologies were excluded from the study.

There are many studies in the literature related to these two maneuvers. Gans et al demonstrated that there were no statistically significant differences between the results of the Epley maneuver and the Semont maneuver in their study on 376 posterior canal BPPV patients, and there was no decrease in the recurrence rate with the Semont maneuver in comparison to the Epley maneuver.[16] In their study, Toupet et al demonstrated that the success rates of the Epley and Semont maneuvers were similar.[17] Herdman et al[18] compared the Epley and Semont maneuvers which were randomly performed in 60 patients with posterior canal BPPV; however, they could not demonstrate any statistically significant differences between the two treatment modalities. In a study of 840 patients with posterior channel BPPV, Steenerson et al[19] showed that the success rates of the Semont and Epley maneuvers were close (98% and 94%, respectively). However, disease recurrence was reported in 16% of the patients after a six-month follow-up period.

Wang et al[20] applied combined treatment with the Epley and Semont maneuvers. The results showed that there was an 85% success rate at the end of three months in patients subjected to the Epley maneuver alone, 84% success rate in patients who were subjected only to the most commonly practiced Semont maneuver, and there was 98% success in administering the two maneuvers in combination, while the difference was found to be statistically significant. The authors noted that the combined use of the two maneuvers increased the success rate and reduced the likelihood of recurrence of the disease. The VNG test was not noted in their publications.

In our study, the success rate with the Epley maneuver was reported as 69.35% on the first day, 75.80% after one week and 85.48% after one month. With the Semont maneuver, the success rate was found to be 63.26% on the first day, 75.51% after one week and 81.63% after one month. The success rate of the combined maneuver was 85.88% on the first day, 90.58% after one week and 95.29% after one month. The healing rate during the combined maneuver was found to be significantly higher than those in the Epley and Semont groups. In our repeated maneuver performed based on two different theories, no other canal escape or canal obstruction was observed in any of our patients.

To prevent debris from returning to the semicircular canal after applying the maneuvers on patients, a suggestion may be made for restriction of motion, such as waiting for 10-minutes after treatment, the necessity of avoiding sudden head movements, using three pillows at bedtime and not lying on the side of the pathology.[21,22] At our clinic, we also advise restriction of movement to our patients. We do not wear any soft cervical collar.

BPPV is a recurrent disease even after appropriate maneuvers.[19] In our six-month follow-up period, recurrence was reported in four (6.4%) of the patients who were subjected to the Epley maneuver and in five (10.2%) of the patients subjected to the Semont maneuver. There was no recurrence in the patients subjected to the combined maneuver (0%). The most important limitations of our study were the absence of control groups not subjected to maneuvers and the lack of prolonged recurrence of the disease for a period longer than six months.

CONCLUSION

The combined maneuvers in our study were found to have an increased success rate. The absence of recurrence during a six-month follow-up period is encouraging. There is a need for further studies to assess long-term outcomes.

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