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ORIGINAL ARTICLE

Comparative Efficacy of Epley, Semont and Gans Maneuver in Treating Posterior Canal Benign Paroxysmal Positional Vertigo

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Abstract

Pharmacological therapies are used to control Benign paroxysmal positional vertigo (BPPV) symptoms for a brief period, discontinuing them usually results in recurrence. Canalolith repositioning maneuvers, including Epley, Semont, and Gans maneuvers, have been recommended for treating posterior canal BPPV with a high rate of success. A prospective, quasi-randomized study was carried out to compare the efficacy of Epley, Semont, and Gans maneuvers in the treatment of posterior canal BPPV and their durability. All patients over the age of 20 who met the BPPV diagnostic criteria, regardless of gender, were included in the study. Diagnosis of BPPV was done by Dix Hallpike maneuver. Typical posterior canal BPPV, the most frequent form of BPPV, is characterized by paroxysmal nystagmus evoked through the Dix-Hallpike test; the nystagmus is torsional clockwise for the left side, counter-clockwise for the right side, with a vertical up-beating component. The patients were uniformly quasi-randomized in a 1:1:1 ratio to be treated with Epley, Semont, and Gans maneuvers. After performing the maneuver, the patients were again subjected to the Dix-Hallpike test. Based on the result of the Dix-Hallpike test's positivity, the maneuvers were repeated up to three times. All the patients were called for a reassessment 30 days after the last intervention to assess the durability of the maneuver. In the study, 54.44% (49) of the 90 patients were female, whereas 45.56% (41) were male. Overall, 83.33% (75) of patients required only one attempt, 15.56% (14) required two attempts, and 1.11% (1) required three attempts to improve. In the Epley maneuvers group, 86.66% (26) required only one attempt, 10% (3) required two attempts, and 3.33% (1) required three attempts. Similarly, 83.33% (25) required only one attempt in the Gans maneuvers group, and 16.67% (5) required two attempts. In Semont maneuver groups, 80% (24) required only one attempt, and 20% (6) required two attempts. The recurrence of the symptoms was seen in a total of 11 patients: 27.27% (3 patients) of the Epley maneuvers group, 36.36% (4 patients) of the Gans maneuvers group, and 36.36% (4 patients) of the Semont maneuvers group. All three maneuvers show equal efficacy in reducing vertigo. The Epley maneuver may be more relevant in the treatment of BPPV compared to others, considering the slightly higher improvement rate and the requirement for fewer attempts for the treatment.

Keywords BPPV · Epley maneuver · Semont maneuver · Gans maneuver · Dix-Hallpike test

Introduction

Benign paroxysmal positional vertigo (BPPV) is one of the most prevalent disorders affecting the inner ear's vestibular system, which assists in balance [1]. It usually appears during the fifth and seventh decades of life, and about half of them are associated with severe traumatic brain injuries [2]. The shift of otoconia from the utricle to one of the semicircular canals results in BPPV. Because of its physical location underneath the utricle, the posterior canal is more affected and is additionally exacerbated by gravity in both upright and sleeping situations [3].

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Pharmacological therapies are used to control BPPV symptoms for a brief period, discontinuing them usually results in recurrence [4–6]. Canalolith repositioning maneuvers, including Epley, Semont, and Gans maneuvers, have been recommended for treating BPPV with a high rate of success [7, 8]. These maneuvers relocate the patient's displaced otoconial debris around the long arm of the semicircular canal, via the common crus, and back into the utricle, relieving their symptoms [9–13]. Epley maneuver is a successful method for treating BPPV that requires rolling movements of the patient's head, neck, and body, whereas the Semont maneuver and Gans maneuver are alternate treatment modalities, particularly in patients with restrictive factors including cervical spondylosis, vertebrobasilar insufficiency, and obesity [14, 15]. In elderly people, hyperextension of the neck for Epley treatment and abrupt lateral motion for the Semont maneuver are not recommended. The Gans repositioning maneuver is a therapeutic option for them.

In this study, we aim to compare the efficacy of the Epley, Semont, and Gans maneuvers in the treatment of posterior canal BPPV and their durability.

Method and Methodology

Study Design

A prospective, quasi-randomized study was carried out to compare the efficacy of the Epley, Semont, and Gans maneuvers in the treatment of posterior canal BPPV and their durability.

Participants

All patients without restriction of gender, above 20 years of age, who met the diagnostic criteria for BPPV, i.e., vertigo associated with characteristic mixed torsional and vertical nystagmus provoked by the Dix-Hallpike test, an average latency of 20 s between the completion of the Dix-Hallpike test and the onset of vertigo and nystagmus, and fatiguability, were included in the study.

Those who are suffering from severe cervical spondylitis, spinal injury, central causes of vertigo, and other causes of peripheral vertigo such as Meniere's disease, vestibular neuronitis, labyrinthitis, and peri-lymphatic fistula were excluded from the study.

Study Procedure

All the patients who presented with clinical features suggestive of BPPV and had a positive Dix-Hallpike test were screened for inclusion and exclusion from the study. After signing the informed consent, patient demographic details, affected side, duration of illness, episodes of vertigo per week, duration of each episode, previous history of clusters of similar symptoms, and comorbidities were documented.

The patients were uniformly quasi-randomized in a 1:1:1 ratio to be treated with Epley, Semont, and Gans maneuvers. After performing the maneuver, the patients were again subjected to the Dix-Hallpike test. Based on the result of the Dix-Hallpike test's positivity, the maneuver was repeated up to three times. All the patients were called for follow-up after 3 days to assess whether they had improved, partially improved, or not improved. Those patients who had shown improvement were called for follow-up after 30 days, and those who had shown partial, or no improvement were repeated with the same maneuver that was performed on day 1 of follow-up and called for a further follow-up visit after 3 days to assess the improvement. The maneuver was repeated three times in three days for those patients who did not show improvement with the first and second attempts. All the patients were called for a reassessment after 30 days after the last intervention to assess the durability of the maneuver (Fig. 1).

Epley Maneuver Procedure

The patient was requested to sit upright on a table or bed and was positioned in such a way that the patient's shoulder should meet the edge of the table or bed when the patient lies down. The examiner takes a position close to the bed to prevent falls. The patient was then instructed to turn his or her head 45° towards the affected side. (The patient was also instructed to keep his or her eyes open so that the examiner could see if he or she had nystagmus.) Then, make the patient lie down quickly with his or her head hanging over the table's edge. The examiner holds the neck in this posture for a total of 30 s. The patient's head was then moved 90° to the opposite side while the patient remained flat on his back and his head hung over the edge of the table or bed. After that, hold the position for 30 s. The patient was asked to turn, or the assistant was asked to turn the patient's body and head at a 45° angle so that the body was facing to the side and the head was towards the ground. After that, hold the position for 30 s. Then the patient's head is rotated 90° to the opposite side while keeping the patient still lying back flat with their head hanging over the edge of the table or bed. The patient was returned to an upright sitting position and asked to sit upright for a period of 10–20 min [16].

Semont Maneuver Procedure

The patient was instructed to sit on the bed's edge. Turn the patient's head 45° to the side that is not affected. The patient was then instructed to lie down rapidly on the affected side.

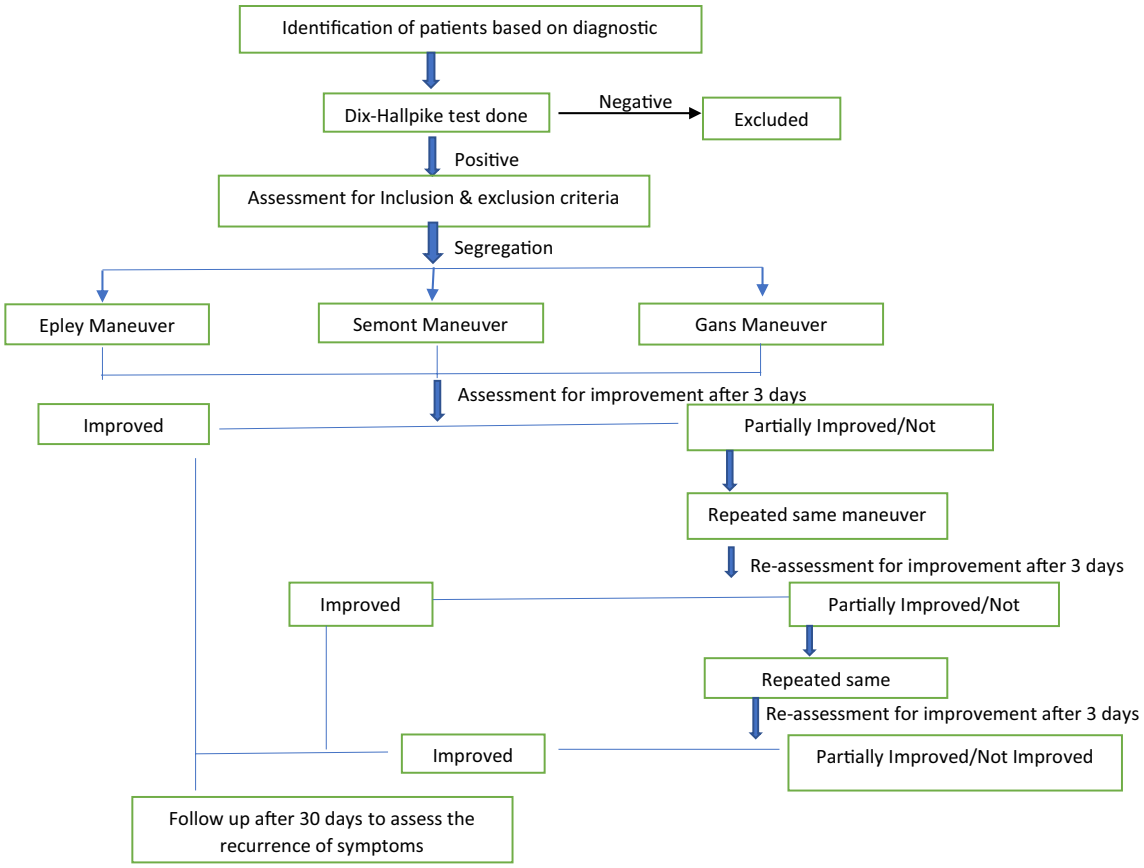

Fig. 1 flow chart of study design

Patients were instructed to maintain the position for 30 s and then move quickly and lie down on the opposite edge of the bed. The patient was not permitted to change his or her head direction. They must have maintained a 45-degree angle and lay down for 30 s, staring at the floor. The patient slowly returned to a sitting position and waited for a few minutes [17].

Gans Repositioning Maneuver Procedure

The patient's head was turned 45° to the unaffected side in the first position, and the patient was made to lie down on the vertigo side. The otolith debris must be moved to the center of the posterior canal in this position. The patient was then forced to roll to the unaffected side while maintaining the same head position at 45° to the unaffected side. This caused otolith debris to be transferred to the common crus. The patient was instructed to shake his or her head 3–4 times in that position. This helped the passage of otolith debris through the common Crus. The patient was returned to their original position, then turned their heads forward to the center position. Otolith debris enters the utricle as a result [18].

Data Analysis

Data were analyzed with SPSS version 23, where percentage and frequency were used for categorical variables, and mean and standard deviation were used for numerical variables. The correlation between age and frequency of vertigo was calculated using the Fischer exact test and the Chi-square test, considering a significant p-value less than 0.05.

Results

A total of 90 patients who met the inclusion criteria were included in the study, with 30 patients randomly assigned to each of the three groups: Epley maneuver, Semont maneuver, and Gans maneuver. 54.44% (49) of the 90 patients were female, whereas 45.56% (41) were male (Table 1). The patients were 45.34 years old on average, with a minimum age of 20 years and a maximum age of 76 years (Table 2). Most patients were between the ages of 41 and 50. 5.56% (5) of the patients had previously sustained a head injury, 1.111% (1) had previously undergone ear surgery, and 18.89% (17) had previously experienced BPPV clusters.

Table 1 Demographic details of the patients, comorbidities, history of patients, nature of vertigo, severity of symptoms, and location of BPPV

Characteristics	Total number patient	Percentage (%)
Gender		
Male	41	45.56
Female	49	54.44
Age groups		
21–30 years	7	7.78
31–40 years	24	26.67
41–50 years	28	31.11
51–60 years	24	26.67
> 60 years	7	7.78
Onset of Vertigo		
< 5 days	23	25.6
6–10 days	19	21.1
11–20 days	24	26.7
21–30 days	16	17.8
> 30 days	8	8.9
Duration of an episode of vertigo		
1–5 Min	86	95.56
> 5 min	4	4.44
Frequency of attacks per week		
1–5	75	83.33
5–10	11	12.22
> 10	4	4.44
History of head trauma	5	5.56
History of ear surgery	1	1.11
History of clusters of BPPV	17	18.89
History of past medication	25	27.78
Comorbidities		
Diabetes mellitus (DM)	25	27.78
Hypertension (HTN)	25	27.78
Both DM & HTN	7	7.78
Severity of symptoms		
Mild	21	23.33
Moderate	57	63.33
Severe	12	13.33
Location of BPPV		
Left BPPV	41	45.56
Right BPPV	46	51.11
Both BPPV	3	3.33

Table 2 Mean, SD, and range

	N	Mean	SD	Range
Age (years)	90	45.34	10.96	21–76
Vertigo days	90	17.31	17.97	1–90

Patients with at least one comorbidity made up 47.78% (43) of the total, with 20% (18) being diabetic and hypertensive and 7.78% (7) having both diabetes and hypertension (Table 1).

In the study, 17.31–17.97 days was the average number of days that patients suffered from vertigo (Table 2). The longest period of vertigo was 11–20 days, followed by less than 5 days, 6–10 days, 21–30 days, and more than 30 days. The longest duration of vertigo was 90 days, and the lowest day was 1 day. A maximum of 95.56% (86) of patients experienced vertigo for one to five minutes, and 4.44% (4) experienced vertigo for more than five minutes. 83.33% (75) patients had 1–5 attacks per week, 12.22% (11) patients had 5–10 attacks per week, and 4.44% (4) patients had more than 10 attacks per week. Symptoms were moderate in 63.33% (57), mild in 23.33% (21), and severe in 13.33% (12). Patients with right-sided BPPV accounted for 51.11% (46) of the total, 45.56% (41) of the total, and 3.33% (3) of the total. Vertigo medications were used by 27.78% (25) of the patients (Table 1 and Fig. 2).

Overall, 23.33% (21) have mild symptoms, including 38.10% (8) from the Epley maneuver group, 47.61% (10) from the Gans maneuver group, and 14.28% (3) from the Semont maneuver group. A total of 63.33% (57) had moderate symptoms, including 29.82% (17) from the Epley maneuver group, 31.58% (18) from the Gans maneuver group, and 38.6% (22) from the Semont maneuver group. Similarly, 13.33% (12) were having severe symptoms, including 41.67% (5) from the Epley maneuver group, 16.67% (2) from the Gans maneuver group, and 41.67% (5) from the Semont maneuver group (Table 3 and Fig. 3).

In the Epley maneuver group, 86.66% (26) required only one attempt, 10% (3) required two attempts, and 3.33% (1) required three attempts. Similarly, in the Gans maneuver group, 83.33% (25) required only one attempt, and 16.67% (5) required two attempts. In Semont maneuver groups, 80% (24) required only one attempt, and 20% (6) required two attempts. Overall, 83.33% (75) of patients required only one

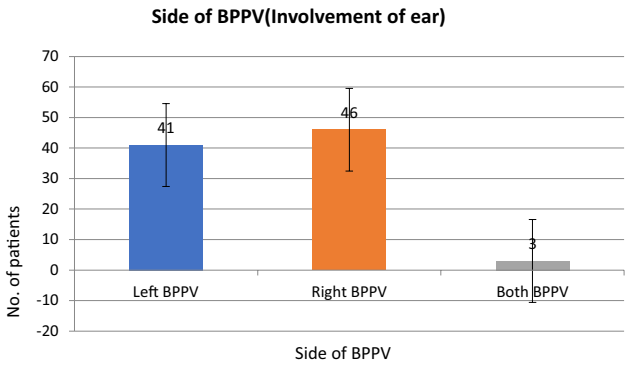

Fig. 2 Distribution of severity of symptoms on different Maneuver

Table 3 Correlation between different maneuvers and number of attempts taken, complication, recurrence of symptoms, and outcome

Character	Different maneuver			
	Epley	Gans	Semont	*P*- Value
Attempts				
1st	26	25	24	0.786
2nd	3	5	6	
3rd	1	0	0	
Severity of disease				
Mild	8	10	3	0.177
Moderate	17	18	22	
Severe	5	2	5	
Complication (Yes)	3	0	0	0.107
Recurrence of symptoms (Yes)	3	4	4	> 0.999
The outcome (Improved)	22	22	24	0.786

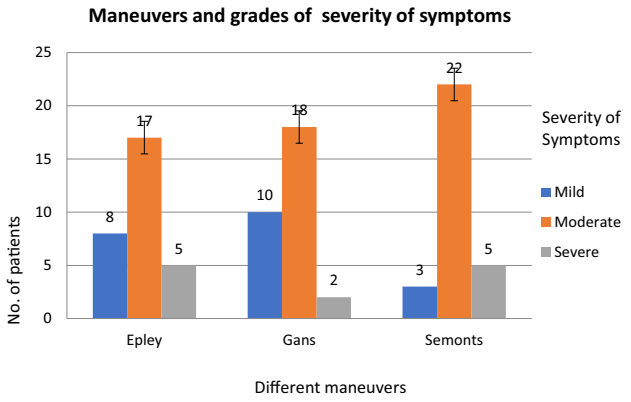

Fig. 3 Location of BPPV

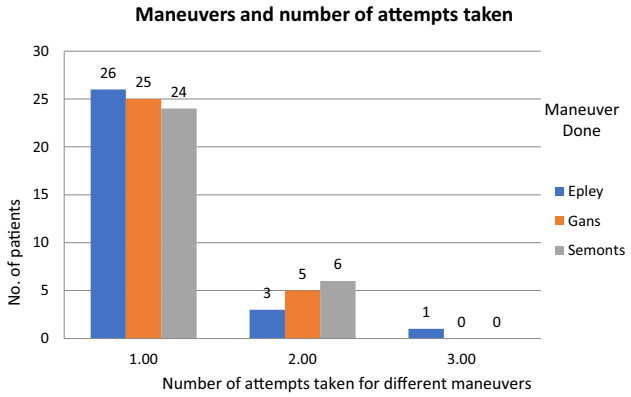

Fig. 4 Outcome of different maneuver

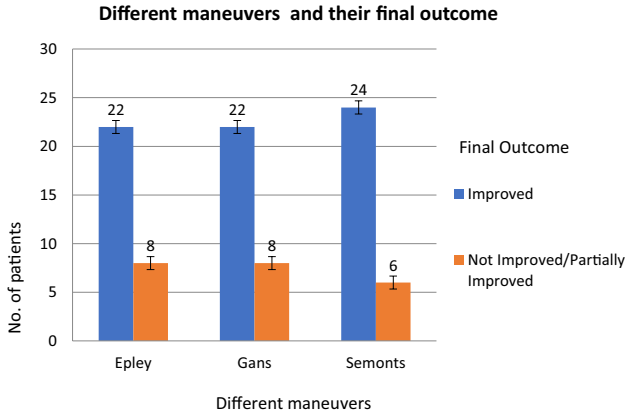

Fig. 5 Number of attempts taken for different maneuvers

attempt, 15.56% (14) required two attempts, and 1.11% (1) required three attempts to improve. Fisher's exact test was used to correlate different maneuvers with the required number of attempts. There was no significant difference observed in the improvements following different maneuvers. The *P*-value was 0.786, which was statistically insignificant (Table 3 and Fig. 4).

The recurrence of the symptoms was seen in a total of 11 patients: 27.27% (3 patients) of the Epley maneuver group, 36.36% (4 patients) of the Gans maneuver group, and 36.36% (4 patients) of the Semont maneuver group. There was no correlation between the different maneuvers used and the recurrence of symptoms, as the *P*-value obtained by implementing Fisher's exact test was > 0.999. The complication was observed only in the Epley maneuver in 10% (3 of the patients) (Table 3).

In total, 75.56% (68) patients were improved, and 24.44% (22) patients were not improved or partially improved by the maneuver after completion of the study. In the Epley maneuver group, 73.33% (22) of patients improved from symptoms, 73.33% (22) from Gans, and 80% (24) from the Semont maneuver. Using the Chi-square test, where the *p*-value was 0.786, no significant differences were seen in the outcome of various maneuvers (Table 3 and Fig. 5).

Discussion

We aimed to compare the efficacy of Epley, Semont, and Gans maneuvers in the treatment of posterior canal BPPV and their durability. In this study, females are more likely to develop BPPV, and most patients were between the ages of 41 and 50, which is consistent with the findings of Alia et al., Ajayan et al., and Kanwar et al. [19–21]. In contrast to Wanees et al. [1], our study has only 5.56% of patients with a history of head or neck trauma. The right ear is more affected in the study, similar to the findings of studies conducted by Ajayan et al., Alia et al., and Wanees et al. [1, 19]. It could be the impact of sleeping habits in the right lateral decubitus position.

The study shows there are no significant differences in effectiveness between different maneuvers in the treatment of BPPV. The same results were obtained in the studies conducted by Abdel et al. and Abir et al. [22, 23]. At least 80% of the patients improved with one attempt from each group, as observed by Kanwar et al. [21]. This indicates that all the maneuvers are effective enough to improve the BPPV. The higher rate of improvement is seen in Epley, followed by Gans and Semont maneuvers. Among the three groups, a greater number of patients required second attempts in the Semont maneuver, followed by the Gans maneuver and the Epley maneuver groups. Similarly, the recurrence of the symptoms was observed less in the Epley maneuver than in others. However, considering the higher improvement rate and the requirement for fewer attempts, the Epley maneuver may be more relevant in treating BPPV than others. Although having a greater improvement rate and requiring fewer attempts in the treatment, the Epley maneuver is also associated with complications such as the onset of nausea or vomiting and lower back pain, which are not observed in the Gans and Semont maneuvers. The combination approach of two different maneuvers, if one maneuver alone is not able to relieve symptoms in a patient, can lead to better results in the treatment.

The study was conducted in a single center, not blinded, with a limited sample size, where patients and the investigator both knew about the maneuvers that were being done to the patients. The patients were followed up only for one month, which limited our understanding of whether any group had long-term effects of treatment failure.

Conclusion

All three maneuvers showed equal efficacy in reducing vertigo. The Epley maneuver may be more relevant in the treatment of BPPV compared to others, considering its slightly higher improvement rate and requirement for fewer attempts. It is also associated with complications such as the onset of nausea or vomiting and lower back pain.

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Declarations

Conflict of interest All authors have declared that there are no conflicts of interest about the subject of this study.

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