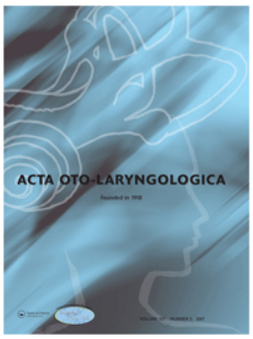

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ORIGINAL ARTICLE

Repositioning intervals in the modified Epley's maneuver and their effect on benign paroxysmal positional vertigo treatment outcome

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ABSTRACT

Introduction: This study showed that short and long interval treatments achieved comparable success rates. There was no statistically significant difference in the rate of early and late recurrences between the two groups. Modified Epley maneuver can be applied in a short interval time with comparable success and recurrence rates which are as effective as in a long interval time.

Objective: The Epley maneuver is called the particle repositioning or canalith repositioning procedure. If a short time interval in each position is effective, it will allow for reduced time and avoid unnecessary physical burden. How long of a stay in each position is not determined in the literature. There is an absence of comparative studies of the BPPV repositioning time. The aim of this study is to compare the treatment time in patients with benign paroxysmal positional vertigo (BPPV).

Study design: Longitudinal prospective study.

Setting: Outpatient practice in a tertiary care facility.

Subjects and methods: Sixty consecutive patients with BPPV were included in this study. These patients were sequentially allocated to one of two groups (A or B). The interval times between each position in group A and B were 15 and 120 s, respectively. Modified Epley maneuver was performed in all patients. The maneuvers in both groups were exactly the same sequence of movements, except interval times.

Results: The mean age of the patients was 49.25 years (range =19–76 years). Of the 60 patients, 48 (80%) were women and 12 (20%) were men. Successful outcome was achieved in 26 patients (86.7%) after the first modified Epley maneuver in both groups. Three patients from each group (total six patients) responded to the third modified Epley maneuver and the remaining two patients did not respond to any modified Epley maneuver. Therefore, the Semont maneuver was applied with a successful result.

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Vertigo; Epley maneuver; benign paroxysmal positional vertigo; interval time; compare; treatment time

Introduction

Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo caused by peripheral vestibular dysfunction. The pathophysiology was originally thought to be cupulolithiasis, and later canalithiasis was shown to be a more predominant etiology. The demonstration of free-floating particles in the endolymph has renewed interest in the physiology and management of this entity [1].

BPPV is a recurrent disorder and around two thirds of the patients have suffered from an episode of BPPV within the past 12 months. The average recurrence rate in patients with a mean follow-up of 10 years is ~50%, while most (80%) are within the first year of treatment. The ratio of female-to-male population is 2/1 in BPPV [2,3].

The diagnosis of BPPV of the posterior semicircular canal (PC-BPPV) is established by the presence of the relevant history and by detecting nystagmus elicited by the provocative maneuver. Modified Epley maneuver is the most commonly applied maneuver to move the free floating particles from the posterior SCC (semicircular canal) to back into the utricle [4]. In the literature, there is no solid consensus on the interval time in each position of the modified Epley maneuver in patients with BPPV. We aimed to compare the efficacy of short interval treatment times with the long interval treatment times, and also early and late recurrences between the groups in this study.

Materials and method

Patient selection

The present study was conducted on 60 consecutive patients who had unilateral PC-BPPV in a tertiary referral University Hospital. These patients were sequentially allocated to one of two groups (A or B). Group A, comprising 30 patients, received short interval treatment between movements; and Group B, including 30 patients, received long interval treatment between movements. The interval times in each position in group A and B were 15 s and 120 s, respectively.

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The demographic characteristics of patients, etiological factors such as head and neck trauma, history of otologic disorder and surgery, hearing loss, history of recurrence of BPPV, and the group of patients (A or B) were recorded. After the recording is finished, the patients in both groups received information verbally from a physician about the maneuvers to be applied and the total treatment time in the outcome clinic before being treated with the repositioning maneuvers.

After a detailed ear–nose–throat examination, audiometric tests were conducted when indicated. Patients with central disorders and patients who had BPPV with the involvement of other canals or bilateral BPPV were also excluded. Pharmacological agents were not given to patients. The patients received follow-up until the 10th month in terms of recurrence after treatment. The protocol of this study was approved by the institutional ethics committee.

Dix–Hallpike test and modified Epley maneuver

The Dix–Hallpike test was performed in all patients. Patients with vertigo and vertical up-beating and rotational nystagmus toward the lower ear were diagnosed with posterior SSC-BPPV. After the Dix–Hallpike test was performed, the modified Epley maneuver was applied accordingly. In Group A, the patients were placed in an upright position with the head turned 45° toward the affected ear, with the eyes kept open. The patients were rapidly laid back to the supine head-hanging position, which is then maintained for 15 s. The head was slowly rotated 90° toward the opposite side and kept there for a period of ∼30 s. This position was held for a further 15 s and, then, the whole body was slowly turned 90° toward the opposite side over a period of ∼15 s. In the last position, the patient was placed in lateral recumbent position, i.e. on either side to his or her shoulder. Fifteen seconds later, the patient was placed in a seated position with the head at 30° of flexion. After another 15 s, the head was returned to the normal position, and the treatment was completed. The interval time between each position in Group B was 120 s instead of the 15 s in Group A. The total duration of modified Epley maneuver was 90 s in Group A and 720 s (6 min) in Group B. The maneuvers in both groups were exactly the same sequence of movements, except for the interval times. The patients with symptoms or nystagmus were documented on visual goggles during the maneuver. If the patients complained of vertigo symptoms during the maneuver in both groups, the time was stopped until the nystagmus and vertigo ceased, and the time during these symptoms were excluded from the whole calculation.

Patient groups and follow-up

The same physician followed all patients weekly to check for recurrence. One week later, the Dix–Hallpike maneuver was repeated. The absence of both nystagmus and vertigo after the maneuver was considered to indicate procedural success. If these symptoms were present, the maneuvers were repeated in accordance with the previous interval times (Group A, 15 s; Group B, 120 s).

Early recurrences were identified as those that occurred between 0–90 days, and late recurrences occurred over 90 days after treatment. The mean follow-up duration was 10 months. The treatments and assessments were conducted by the same physician.

Statistical analysis

Statistical analysis of the results was performed using SPSS for Windows 22.0 (Chicago, IL). The proportions of patients with BPPV were presented by gender, age, history of etiological factors, history of otologic disorder and surgery, and history of recurrence using cross-tabulation. Comparisons of data between groups were made using the Chi-square test and Fischer's exact test. $P < .05$ was determined as statistically significant.

Results

Demographic data

The mean age of the patients was 49.25 years (range =19–76 years). Of the 60 study patients, 48 (80%) were women and 12 (20%) were men. The female-to-male ratio was 4:1. The right posterior SSC-BPPV was affected in 26 patients, and the left PSSC-BPPV was affected in 34 patients.

Group A included 30 (50%) patients, with a mean age of 46.63 years. In Group A, eight patients had a history of BPPV related attack, five patients had hearing loss, three patients had a history of otologic surgery, one patient had a history of otitis media, and one patient had a history of head trauma.

Group B included 30 (50%) patients, with a mean age of 51.9 years. Four patients had a history of BPPV-related attack, seven patients had hearing loss, two patients had a history of otologic surgery, two patients had a history of otitis media, and eight patients had a history of head trauma (Table 1).

There were statistical differences between the groups in gender distribution ($p = .01$). Group B included more females than males. There was no statistical differences between the groups in terms of BPPV-related attack ($p = .10$) (Table 1).

Procedural success

Successful repositioning occurred in both groups equally after the first modified Epley maneuver in 26 patients (Group A and Group B, 86.7%). Each group included four

Table 1. History of etiological factors.

Etiologic factor	BPPV	Hearing loss	Otologic surgery	Otitis Media	Head trauma
Group A	8	5	3	1	1
Group B	4	7	2	2	8

Table 2. Comparison of treatment response between the groups.

	First maneuver	Second maneuver	Third maneuver	Semont maneuver	*p*-values
Group A					
Positive (*n*, %)	26 (86.7%)	0 (0%)	3 (10%)	1 (3.3%)	
Negative (*n*, %)	4 (13.3%)	4 (13.3%)	1 (3.3%)	0 (0%)	NS
Total (*n*, %)	30 (100%)	4 (13.3%)	4 (13.3%)	1 (3.3%)	
Group B					
Positive (*n*, %)	26 (86.7%)	0 (0%)	3 (10%)	1 (3.3%)	
Negative (*n*, %)	4 (13.3%)	4 (13.3%)	1 (3.3%)	0 (0%)	NS
Total (*n*, %)	30 (100%)	4 (13.3%)	4 (13.3%)	1 (3.3%)	

NS: non-significant; Positive: complete response; Negative: no response.

patients (total eight patients) who did not respond to the first maneuver. One week after the first treatment, the second maneuver was performed in eight patients, but none of the eight patients responded to the maneuver. Two weeks after the first treatment, three patients in each group (total six patients) responded to the third maneuver. Only two patients who did not respond to three modified Epley maneuvers eventually responded positively to the Semont maneuver (Table 2). Thus, the success rate of modified Epley maneuver was 96.67% in each group. All of the patients improved with maneuvers (modified Epley maneuver, 58 patients; and Semont, two patients), and surgical treatment was not required for any patient.

Early recurrence

Early recurrence occurred in four (13.3%) of the 26 successfully treated patients in both groups. There was no statistically significant difference in the rates of early recurrence between these two groups ($p > .05$; Table 2). Thus, early recurrence occurred in five (16.6%) of the eight patients with a history of trauma, four patients (13.3%) had BPPV-related attack, two patients (6.6%) had hearing loss, and one patient (3.3%) had anxiety. All of the eight patients with early recurrence again underwent the maneuver, which was successful in six patients. Two patients who did not respond to the modified Epley maneuver responded to the Semont maneuver. These two patients had a history of head and neck trauma and a history of BPPV related attack and both were over the age of 60. One of the two patients who had the Semont maneuver was in Group A, the other was in Group B. In both groups, early recurrence was detected in the first month. There was no statistically significant relationship recurrence between history of otologic disorder, surgery, and hearing loss (Table 1).

Late recurrence

None of these patients had late recurrence up to the average follow-up of 10 months. There was no statistically significant difference in the rate of late recurrence between the groups ($p > .05$).

Discussion

BPPV is a common disorder with prevalence of 0.5% in individuals between 18–39 years of age and 3.4% in people over 60-years of age. It accounts for 8% of the subjects with moderate or severe dizziness/vertigo [2]. The most widely used diagnosis of SCC-BPPV is the Dix-Hallpike maneuvers [5]. Lopez-Escamez et al. [6] have reported a sensitivity of 82% and specificity of 71% for the Dix-Hallpike maneuvers in posterior SSC-BPPV. Soto Varela et al. [7] randomized patients for treatment with modified Epley maneuver, Semont maneuver, or Brandt-Daroff exercises. Symptom resolution among those treated with either modified Epley maneuver or Semont maneuver at 1 week were comparable (74% vs 71%, respectively), but only 24% for Brandt-Daroff exercises. At 3-month follow-up, patients with modified Epley maneuver demonstrated superior outcomes compared with those treated with Semont maneuver. However, because of limited studies with direct comparisons between the Semont maneuver and the modified Epley maneuver, no conclusions about differential effectiveness can be drawn.

Epley [8] and Ozturan et al. [9] have reported 97.7% and 88% success rates, respectively, after a single modified Epley maneuver, along with 30% and 11.7% recurrence rates, respectively. Hughes et al. [10] have reported a 47% success rate following one Epley maneuver and 84% following three or fewer Epley maneuvers. In this study, the success rates achieved following the first modified Epley maneuver in both groups was 86.7%.

CRP is the most commonly performed treatment method after confirmation of the posterior SSC-BPPV with a diagnostic maneuver. CRP provides rapid and long-lasting relief of symptoms in BPPV patients [5]. Despite numerous published studies regarding BPPV and its treatment with CRP in the literature, there is still no consensus concerning the duration of a maneuver, and no report comparing the interval time. Interval time in each position varies between 10–120 s in the literature (Table 3). Large variations of the interval times in the literature were compiled in Table 3 and sorted according to the duration in an increasing manner [8–19]. It would be useful to corroborate if the short application of CRP is as effective as the long ones. Therefore, this study was designed to investigate the role of interval times of 15 and 120 s in each position in Group A and B, respectively, between the head movements during the modified Epley maneuver.

Patients who developed BPPV after trauma and those with ipsilateral Meniere's disease have been shown to have a high BPPV recurrence rate [7,20]. In this study, early recurrence was shown in five of the nine patients with a history of head trauma and four of the 22 patients who had

Table 3. Comparison of the studies in terms of interval time and follow-up.

Study	Maneuver	Follow-up (months)	Interval time (s)
Cohen et al. [11], (2004)	Epley, Augmented Epley	6	10
Bhattacharyya et al. [12], (2008)	Modified Epley maneuver	3	20–30
Shan et al. [13], (2014)	Computer-Controlled Repositioning Procedure	1 week	20–30
Fyrmpas et al. [14], (2013)	Modified Epley maneuver	10	30
Tan et al. [15], (2014)	Modified Epley maneuver, vertigo treatment, and rehabilitation chair	6	30
Li and Epley [16], (2005)	Modified Epley, 360 degree maneuver	1	30–40
Lopez-Escamez et al. [17], (2008)	Modified Epley maneuver	12	60–120
Balikci and Ozbay [18], (2014)	Modified Epley maneuver	12	120
Ozturan et al. [9], (1998)	Modified Epley maneuver	3 weeks	120
Leong and Golding-Wood [19], (2008)	Modified Epley maneuver	12	120

previously BPPV related attacks. Only one patient had Meniere's disease, and an endolymphatic sac surgery was performed. We did not detect any early or late recurrence for BPPV. In this study, the presence of an equal number of recurrences in patients in both groups suggested that recurrence cannot be influenced by interval duration of CRP.

We performed the Semont maneuver in two patients. One of two patients was in Group A, the other was in Group B. These two patients were over the age of 60, had a history of head and neck trauma, and a history of BPPV related attack. We think that this may be due to the pathophysiology of cupulolithiasis over the age of 60.

Patients with BPPV are concerned about the treatment and also tend to wonder about how long the treatment time should be. Shortening the time of treatment provides us with various advantages. Hereby, the total treatment time is decreased and labor is reduced. We think that shortening the time of treatment may improve treatment adherence, especially for the successive CRP sessions following the failed ones. Both the patient and the doctor will spend less effort and time by this method. On the other hand, longer treatment may potentially lead to lower back and neck pain in patients.

Conclusion

This study showed that short and long interval treatment times achieved the same success rates. There was no statistically significant difference in the rate of early and late recurrence between the two groups either. Modified Epley maneuver can be safely applied in a shorter time period with similar success and recurrence rates. A shortened modified Epley maneuver saves time for the physicians and patients and avoids the laborious and straining burden of the treatment.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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