ORIGINAL ARTICLE

Efficacy Positional Vertigo of Particle Repositioning Manoeuvres in Benign Paroxysmal

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ABSTRACT

Background: The canalith repositioning procedure (CRP), developed by Epley, was designed to use gravity to treat canalithiasis of the PC. The clinician moves the patient through a series of 4 positions. With each position, the otoconia settle to the lowest part of the canal, move around the arc of the PC, and finally deposit in the vestibule.
Aim: To determine the efficacy of particle repositioning manoeuvres in benign paroxysmal positional vertigo.
Study design: Cross Sectional Validation Study
Settings: Department of ENT, Shaikh Zayed Hospital, Lahore
Study duration: 20thAugust 2018 to 19th February 2019
Methods: A total of 94 patients with benign paroxysmal positional vertigo, 20 to 60 years of age of either gender were included. Patients with cervical spondylosis, ongoing CNS disease (stroke or TIA), and cardiovascular disease and pregnant women were excluded. After this, the Epley manoeuvre (patient was placed in a sitting position with the head turned 45° towards the affected side and then reclined past the supine position) was used to treat the posterior and superior canals, and Lempert manoeuvre (patient lied supine with affected ear down, then quickly turn the head 90° towards the unaffected side, facing up and wait 15-20 seconds between each head turn) was used to treat the horizontal canal.
Results: Age range in this study was from 20 to 60 years with mean age of 41.78 ± 9.55 years. Out of 94 patients, 49 (52.13%) were male and 45 (47.87%) were females with male to female ratio 1.1:1. In our study, efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo was found in 60 (63.83%) patients.
Conclusion: This study concluded that efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo is quite high.
Keywords: benign paroxysmal positional vertigo, particle repositioning manoeuvres, efficacy.

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) presents as brief periods of vertigo experienced with a change in the position of a person's head relative to gravity. Benign paroxysmal positional vertigo is a mechanical disorder of the inner ear and is caused by abnormal stimulation of 1 or more of the 3 semicircular canals[1].The diagnosis of BPPV is based on history and findings on positional testing[2]. Patients who complain of vertigo with rolling in bed or getting out of bed are 4.3 times more likely to have BPPV. The Dix-Hallpike test and the side-lying test are the standard tests for evaluating posterior canal BPPV[3,4].

Benign positional vertigo (BPV) is caused by calcium carbonate particles called otoliths (or otoconia) that are inappropriately displaced into the semicircular canals of the vestibular labyrinth of the inner ear. These otoliths are normally attached to hair cells on a membrane inside the utricle and saccule. Because the otoliths are denser than the surrounding endolymph, changes in vertical head movement causes the otoliths to tilt the hair cells, which sends a signal informing the brain that the head is tilting up or down[3].

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The utricle is connected to the 3 semicircular canals. The otoliths may become displaced from the utricle by aging, head trauma, or labyrinthine disease. When this occurs, the otoliths have the potential to enter the semicircular canals. When they do, they usually enter the posterior semicircular canal because this is the most dependent (inferior) of the 3 canals, and so gravitational forces will result in most otoliths entering the posterior canal.

According to the canalolithiasis theory (the most widely accepted theory describing the pathophysiology of benign positional vertigo), the otoliths are free-floating within the semicircular canal. Changing head position causes the misplaced otoliths to continue to move through the canal after head movement has stopped. As the otoliths move, endolymph moves along with them and this stimulates the hair cells of the cupula of the affected semicircular canal, sending a signal to the brain that the head is turning when it is not. This results in the sensation of vertigo. When the otoliths stop moving, the endolymph also stops moving and the hair cells return to their baseline position, thus terminating the vertigo and nystagmus. Reversing the head maneuver causes the particles to move in the opposite direction, producing nystagmus in the same axis but reversed in direction of rotation. The patient may describe that the room is now spinning in the opposite

direction. When repeating the head maneuvers, the otoliths tend to become dispersed and thus are progressively less effective in producing the vertigo and nystagmus (hence, the concept of fatigability)[4].

It was noted that the disease could be cured by a chemical labyrinthectomy and eighth nerve section. Gacek proposed transection of only the posterior ampullary nerve for relief of BPPV, confirming the posterior canal origin. In most patients, however, Epley's canalith repositioning maneuver is adequate treatment, and no surgery is required.[5,6] First-line therapy for BPPV is organized around repositioning maneuvers. For posterior canal BPPV, the maneuver developed by Epley is particularly effective.[7] In a study, the Epley manoeuvre showed an efficacy of 74.6 and 100% at first attempt for posterior and superior canals respectively. The efficacy of the Lempert manoeuvre for the horizontal canal was 72.72% in the patients with canalolithiasis, and 58.33% in the patients with cupulolithiasis[8].

The rationale of my study was to determine the efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo in local population. As the available literature on this is very scarce as well as no local data is available on this, so my study will be a useful addition in the existing literature and also provide the local stats of the problem. Then on the basis of this study, the maneuver with better results can be opted routinely in our practice in order to reduce the morbidity of our population.

The objective of the study was to determine the efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo."

OPERATIONAL DEFINITIONS

Benign positional paroxysmal vertigo: all patients presenting with history of sudden onset of vertigo while trying to sit up suddenly and positive Dix-Hallpike test (rapidly moving the patient from a sitting position to the supine position with the head turned 45° to the right. After waiting approximately 20-30 seconds, the patient will be returned to the sitting position. If no nystagmus was observed, the procedure was then repeated on the left side).

Efficacy: was taken as yes if there was no benign positional paroxysmal vertigo after 3 months of manoeuvre, otherwise taken as no.

Hypertension: all known hypertensive (blood pressure >140/90 mmHg on 2 consecutive occasions) patients for last 2 years and taking medication.

Diabetes mellitus: all known diabetic (FBS >110 mg/dl on 2 consecutive occasions) patients for last 2 years and taking medication.

MATERIALS & METHODS

This descriptive, cross-sectional study was conducted in the Department of ENT, Sheikh Zayed Hospital, Lahore from 20th August 2019 to 19th February 2020. A sample size of 94 is calculated by taking 95% confidence level, 10% margin of error and efficacy of the Lempert manoeuvre as 58.33%. Sampling technique used was non-probability, consecutive sampling. All male and female patients between the age of 20-60 years with benign positional paroxysmal vertigo as per-operational definition were included in the study. The patients with cervical spondylosis, ongoing CNS disease (stroke or TIA), and cardiovascular disease and pregnant women (as assessed on history and medical record) were excluded.

Total number of 94 patients presented to Department of ENT of Sheikh Zayed Hospital, Lahore, fulfilling the inclusion criteria are selected. Informed consent is taken from each patient. After this, the Epley manoeuvre (patient was placed in a sitting position with the head turned 45° towards the affected side and then reclined past the supine position) was used to treat the posterior and superior canals, and Lempert manoeuvre (patient lied supine with affected ear down, then quickly turn the head 90° towards the unaffected side, facing up and wait 15-20 seconds between each head turn) was used to treat the horizontal canal. All patients were followed by the researcher and efficacy was noted at the end of 3 months (as per-operational definitions). This all data (age, gender, hypertension, diabetes mellitus) was recorded on a specially designed proforma.

Statistical analysis is performed using SPSS version 20.0. Age was presented as mean and standard deviation. Gender, hypertension (yes/no), diabetes mellitus (yes/no) and efficacy (yes/no) is presented as frequency and percentage.

Effect modifiers like age, gender, hypertension (yes/no) and diabetes mellitus (yes/no) was controlled through stratification and post-stratification chi square test was applied to see their effect on frequency of insulin resistance. P-value ≤ 0.05 was considered as significant

RESULTS

Age range in this study was from 20 to 60 years with mean age of 41.78 ± 9.55 years as shown in Table I.

Out of 94 patients, 49 (52.13%) are male and 45 (47.87%) are females with male to female ratio 1.1:1 as shown in Figure V. Distribution of patients according to DM & HTN is shown in Table II & III respectively.

In our study, efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo is found in 60 (63.83%) patients (Figure VI). Stratification of efficacy with respect to age groups and gender is shown in Table IV & V respectively. Table VI& VII have shown the stratification of efficacy with respect to DM & HTN respectively.

Table-I: Distribution of patients according to Age (n=94).

Age (in years)	n	%age
20-40	47	50.0
41-60	47	50.0
Total	94	100.0

Mean ± SD = 41.78 ± 9.55 years

Table-II: Distribution of patients according to DM (n=94).

Diabetes mellitus	n	%age
Yes	45	47.87
No	49	52.13

Table-III: Distribution of patients according to hypertension (n=94).

Hypertension	n	%age
Yes	37	39.36
No	57	60.64

Figure 1: Distribution of patients according to gender (n=94).

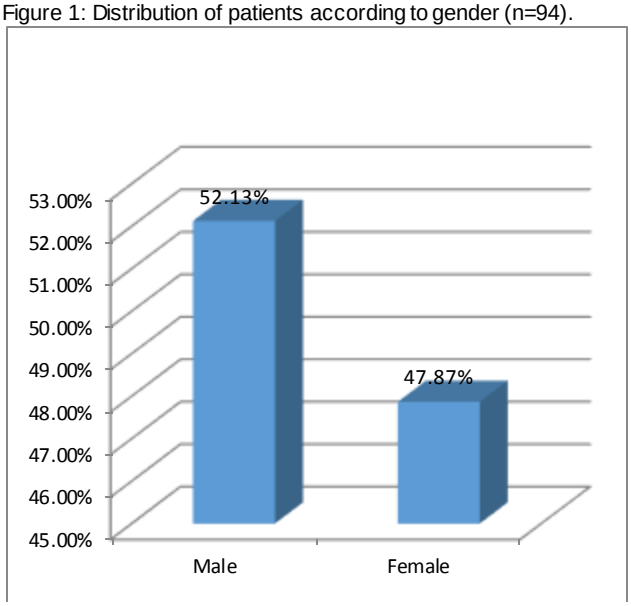

Figure II: Efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo (n=94

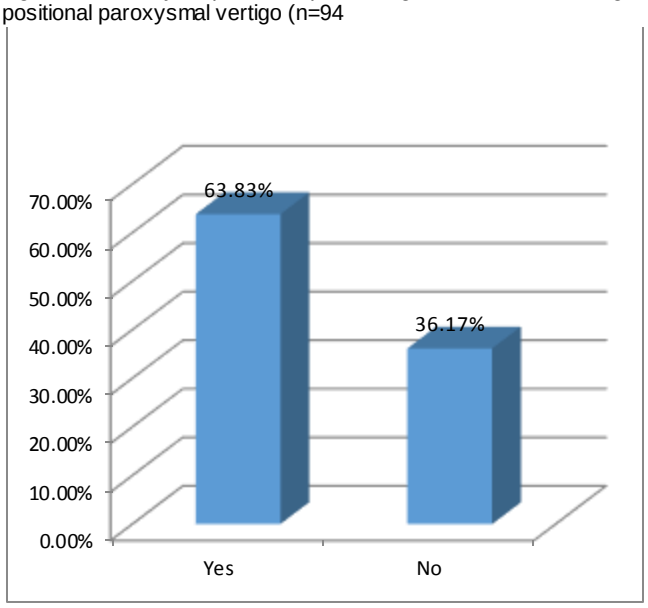

Table IV: Stratification of efficacy with respect to age groups.

Age (years)	Efficacy		p-value
	Yes	No	
20-40	27	20	**0.198**
41-60	33	14	

Table V: Stratification of efficacy with respect to gender.

Gender	Efficacy		p-value
	Yes	No	
Male	28	21	**0.159**
Female	32	13	

Table VI: Stratification of efficacy with respect to DM.

DM	Efficacy		p-value
	Yes	No	
Yes	29	16	**0.905**
No	31	18	

Table VII: Stratification of efficacy with respect to HTN.

HTN	Efficacy		p-value
	Yes	No	
Yes	25	12	**0.543**
No	35	22	

DISCUSSION

The canalith repositioning procedure (CRP), developed by Epley[46], was designed to use gravity to treat canalithiasis of the PC. The clinician moves the patient through a series of 4 positions. With each position, the otoconia settle to the lowest part of the canal, move around the arc of the PC, and finally deposit in the vestibule. This procedure requires a 180-degree turn of the head[47-49] and a return to a sitting position from lying on the uninvolved side.49 To enable the otoconia to settle, each position is maintained for at least 30 seconds.48 Vibration applied to the mastoid process of the involved side does not affect the outcome of the procedure and is no longer considered necessary[50-52]. I have conducted this study to determine the efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo.

Age range in my study was from 20 to 60 years with mean age of 41.78±9.55 years. Out of 94 patients, 49(52.13%) were male and 45(47.87%) were females with male to female ratio 1.1:1.In our study, efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo was found in 60 (63.83%) patients. In a study, the Epley manoeuvre showed an efficacy of 74.6 and 100% at first attempt for posterior and superior canals respectively. The efficacy of the Lempert manoeuvre for the horizontal canal was 72.72% in the patients with canalolithiasis, and 58.33% in the patients with cupulolithiasis[8].

In 2 double-blind RCTs53, the odds in favor of the resolution of BPPV were 22 times (95% confidence interval=3.41-141.73) and 37 times (95% confidence interval=8.75-159.22) higher in people receiving the canalith repositioning procedure (CRP) than in people receiving a sham treatment. This finding was supported by the results reported in 8 nonmasked quasi-RCTs. Studies with limited methodological quality suggested that a liberatory maneuver (LM) was more effective than a control intervention; there was no significant difference in the effectiveness of the LM and the effectiveness of the CRP; the self-administered CRP was more effective than the self-administered LM; and the CRP administered together with the self-administered CRP was more effective than the CRP administered alone. The Brandt-Daroff exercises were the least effective self-administered treatments[53].

In another study54, seventy-eight percent of patients with BPPV no longer demonstrated characteristic positional nystagmus after 1 particle repositioning maneuver compared with 71% of patients with BPPV+ (p = 0.56) who did, whereas 13% of the BPPV and 14% of the BPPV+ group required more than 1 treatment to be rendered nystagmus negative on Dix-Hallpike testing (p = 0.89). However, 14% of patients with BPPV remained dizzy, compared with 63% patients from the BPPV+ group, despite a negative Dix-Hallpike test after treatment (p= 0.0018). Patients with horizontal canal paresis (n = 15) had a better outcome than patients with central vestibular dysfunction (n=7, p= 0.006). Etiologic factors seemed to affect outcome-patients with

idiopathic BPPV and those with a preceding acute vestibular neuronitis had a tendency for a better outcome than BPPV patients with any other etiology (p = 0.058).54

A review of the literature revealed the extremely good results of the Epley maneuver. In one study, the success rate after 1 week was 63.6%, which increased to 72.7% after 2 weeks.55 One Brazilian study also revealed similar results.56 A meta-analysis done by Prim-Espada et al. on the efficacy of Epley's maneuver in benign paroxysmal positional vertigo using a critical review of the medical literature concluded that the patients on whom Epley's maneuver was performed had six and half times more chance of their clinical symptoms improving compared to the control group of patients (OR = 6.52; 95% CI, 4.17–10.20).57 The efficacy of Epley's maneuver in the treatment of BPPV was assessed in a study of 62 patients conducted by Khatri et al. Patients were selected based on symptoms of positional vertigo and positive Dix-Hallpike's test. At the end of 1 month patients were assessed subjectively by visual analogue scale (VAS) and objectively by Dix-Hallpike's positional test. On VAS, 85.7% of patients had complete resolution of symptoms of BPPV in both groups. Objectively 88.2% did not have positional nystagmus after 1 month in first group, whereas in the second group 86% had complete response at the end of 1 month of therapy.58

Hain et al. detected a 17% rate of recurrence duringthe first four to six months after treatment, increasing to47% of patients treated by the repositioning maneuverafter five years of follow-up.59 These results suggestthat there is a cumulative increase of BPPV recurrenceover time.59Sidhar and Panda detected recurrence in 5% of a group of 40 patients after six months of treatment, a rate that increased to 10% one year after discharge from treatment.60 Maia et al. detected a 12.5% rate of recurrence one year after discharge in a group of eight patients.61 The cases in question were treated again by repositioning maneuvers with therapeutic success, in agreement with the proposals of Epley, who stated that, even among patients correctly treated for BPPV, there may be a rate of recurrence of symptoms of 30 to 45%.62

A retrospective study by Tirelli et al indicated that patients with recurrent BPPV who undergo repeated CRP have a significantly increased dizziness recovery rate but do not have a significant difference in BPPV recurrence, compared with patients who have undergone an initial treatment with CRP but not repeated procedures.25A retrospective study by Yoon et al of 1900 patients indicated that the following risk factors increase the chance that a patient with BPPV will need multiple CRPs: longer pretreatment duration of vertigo, involvement of bilateral or multiple canals, and age over 50 years.43

Chung–Lan Kaobc suggested the involvement of deranged calcium metabolism in idiopathic BPPV and a significant association between osteopenia/osteoporosis and idiopathic BPPV and thus concluded that BPPV is prone to occur and recur in people of senior age. We found no association with hypertension in our BPPV patients. Cohen et al., 2004 suggested that comorbid conditions, particularly diabetes, sinus disease, and mild head trauma are unusually prevalent in BPPV patients.63 Giovanni Paolo Santoro, 2010 also suggested that many factors have been associated with BPPV like: Mature age, female sex, some systemic diseases (hypertension, diabetes, osteoporosis), neurological diseases (migraine, head trauma) and otological diseases (Meniere's disease, vestibular neuritis, otosclerosis, chronic ottitis media), head surgery and intubation.64 This was further supported by De Stefano et al., 2014 who conducted a multicenter observational study on the role of comorbidities in the recurrent episodes ofBPPV and concluded that there was a statistically significantdifference between the number of comorbidities and thenumber of recurrences, otherwise said as comorbiditydisorders increased the number of relapses increased too.65

In a randomized controlled trial66 of 58 adults, canalith repositioning procedure (CRP, or modified Epley maneuver) in addition to cinnarizine (an antivertiginous drug) was a more effective treatment for benign paroxysmal positional vertigo (BPPV) compared to cinnarizine alone. The internal validity of this study was strong due to blinding of assessors and successful randomization into groups. The NNT to resolve subjective vertigo symptoms was only 4 (95% CI, 1.9 – 3.6) and the NNT to result in 1 less person having a positive Dix-Hallpike was 3 (1.8 – 5.4). Four subjects (7%) reported having fainting, pallor, and sweating from the CRP technique, but these resolved once treatment was finished. The CRP is an effective treatment that only requires a few minutes. Seven subjects in the treatment group and 14 subjects in the control group required more than one intervention. This procedure does not require additional equipment, thus keeping costs low. The results of this study support using the modified Epley maneuver in addition to cinnarizine compared to solely taking cinnarizine to treat patients who come to the clinic with BPPV. The mean duration of BPPV symptoms in this study for the treatment group was 31 days and 39 days for the control group.66

In a prospective study67 of 592 adults, canalith-repositioning procedure (CRP) was an effective treatment for benign paroxysmal positional vertigo (BPPV) over a long period of time. At 2-days post-CRP, only 13% of the subjects had a positive DixHallpike test (indicative of BPPV). At the 7-day reassessment, only 6% of the subjects had a positive Dix-Hallpike test. The authors stated that 84% of subjects required only1 maneuver to resolve symptoms initially, whereas the other 16% required at least 2 maneuvers. Only 8% of subjects experienced severe nausea and vertigo. For 2-3 days following the CRP, 74% of subjects experienced instability or sensations of lightheadedness.67

CONCLUSION

This study concluded that efficacy of particle repositioning manoeuvres in benign positional paroxysmal vertigo is quite high. So, we recommend that particle repositioning manoeuvres should be used routinelyin benign positional paroxysmal vertigo in order to reduce the morbidityof these patients.

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