



Epley's Manoeuvre: A Single Line Treatment for Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo

Diksha Gupta¹ · Bharti Solanki¹

Received: 3 April 2021 / Accepted: 20 June 2021 / Published online: 26 June 2021
© Association of Otolaryngologists of India 2021

Abstract Benign Paroxysmal Positional Vertigo (BPPV) is the commonest cause of peripheral vertigo. Displaced free floating otoconia in the semicircular canals are responsible for brief attacks of vertigo and nystagmus. Epley's manoeuvre relocates these particles into the utricle. Here we studied the efficacy of Epley's manoeuvre in posterior semicircular canal BPPV without labyrinthine sedatives. 120 patients presented with positional vertigo were included in the study based on positive Dix- hallpike test from August 2018 to July 2019. These patients were treated with only the Epley's manoeuvre and followed up for 6 months. Patients who were previously on labyrinthine sedatives were advised to stop them and treated with only the Epley's manoeuvre. In our study of 120 patients, mean age was 43.5 yrs. Females (52.5%) were commonly affected. Left side posterior semicircular involvement was more than the right side. Epley's manoeuvre had 90% efficacy at 1st week and 100% efficacy at 4th week. Duration of vertigo had significant association ($p < 0.01$) with the number of sessions required. There was significant improvement in the duration of vertigo attack ($p < 0.0001$) and frequency of attack ($p < 0.0001$) before and after the manoeuvre. Epley's manoeuvre lead to significant ($p < 0.001$) improvement in the quality of life of affected patients measured by DHI scoring. In our 6 months follow up, 10 recurrences occurred having significant ($p < 0.01$) association with the duration of vertigo attack. Only Epley's manoeuvre without any labyrinthine sedatives is an effective treatment for posterior semicircular canal BPPV

patients. It also improves the quality of life of affected patients.

Keywords Vertigo · Benign · Positional · Manoeuvre

Abbreviations

BPPV Benign Paroxysmal Positional Vertigo
DHI Dizziness Handicap Inventory

Introduction

Benign paroxysmal positional vertigo (BPPV) is characterised by brief attacks of vertigo, with associated nystagmus, precipitated by certain changes in head position with respect to gravity [1, 2]. It accounts for 20% of all vertigo cases [2, 3]. Its lifetime prevalence is 2.4% with a 1 year prevalence of 1.6% and 1 year incidence of 0.6% [4]. It can recover spontaneously by 1 month in 20% and by 3 months in 50% [5, 6]. Idiopathic BPPV is most common between the ages of 50 and 70, although it can found in all age groups. BPPV may also occur in other conditions like post head trauma [7, 8], vestibular neuritis [9], Meniere's disease, Cogan's syndrome or systemic diseases like hypertension, diabetes mellitus, following prolonged bed rest [10] Sex distribution is about equal for post-traumatic and post vestibular neuritis BPPV, although in its idiopathic form appears to be more common in females [7]. It occurs if free floating otoconia finds its way on changing head position into the duct of a semicircular canal (canalolithiasis) or attach themselves to the cupula of a semicircular canal (cupulolithiasis) which leads to vertigo & nystagmus in plane of stimulated semicircular canal.

✉ Diksha Gupta
diksha06gupta@gmail.com

¹ Department of ENT, Dr. S.N. Medical college, Hostel no: 9, shastri nagar, Jodhpur, Rajasthan, India

Posterior semicircular canal (60–70%) is most commonly affected followed by horizontal semicircular canal (5–3%) and the anterior semicircular canal variant is rare [4, 11, 12]. The propensity of the particles to be accumulated in the posterior canal can be related to the anatomical factors like size of the common crus of the posterior and superior canals, its position below the utricle when erect and its dependent position when both erect and supine.

Various positions which can provoke the vertigo attack are turning over in bed, lying down in bed and extending the neck upward while reaching overhead. Some attacks are accompanied by nausea and vomiting. In 1952, Dix-Hallpike described the test manoeuvre in which vertigo and nystagmus occurs on placing the patient rapidly to a supine position with the head in hyperextension to either side. The nystagmus has a short latency of 1 to 5 s and fatigues after 30 to 45 s. The nystagmus will be torsional in posterior semicircular canal, horizontal in cases of the affected lateral semicircular canal and vertical in case of affected anterior semicircular canal. Rapid movement of the head causes otoliths to inappropriately trigger the receptors in the semicircular canals and send false signals to the brain in this test and results in vertigo and nystagmus. Typically, the nystagmus reverses when the patient returns to an upright position and fatigues as the manoeuvre repeats.

In 1992, Epley first reported canalolith repositioning procedure for posterior semicircular canal BPPV [13]. This manoeuvre relocates free floating particles from the posterior semicircular canal back into utricle, thus relieving the symptoms of vertigo.

It is common for physicians to treat BPPV patients mainly with benzodiazepines, antihistamines and anticholinergic medications. Patients take these medications for a long period of time but still not get complete relief.

Here we studied the efficacy of Epley's manoeuvre in newly diagnosed posterior semicircular canal BPPV patients and also in those ones who were on long term medications (labyrinthine sedatives) but having recurrent attacks. They were treated only by the Epley's manoeuvre.

Methodology

Study design: prospective observational study.

Study area: outpatient department of ENT Dr. S.N. medical college, Jodhpur.

Study period: 1 year from August 2018 to July 2019.

All patients diagnosed with posterior semicircular canal BPPV presented in ENT outdoor were included in the study.

Inclusion Criteria

1. Subject is a male or female above 18 years of age and below 60yrs.
2. All patients presented with vertigo irrespective of duration with positive Dix-Hall pike manoeuvre. A Dix-Hall pike manoeuvre was positive when the patient experienced nystagmus and that resolved in less than 60 seconds. Posterior canal BPPV is present if torsional nystagmus is present in Dix-Hallpike test.
3. Patient willing for participation in the study.

Exclusion Criteria

1. Age more than 60yrs and less than 18yrs.
2. Subjects who are unable to ambulate.
3. Subjects with severe cervical spine disease.
4. Vertigo due to other CNS causes or causes which lead to symptoms mimicking vertigo like anxiety disorders, syncope.

All patients presented to outpatient department with giddiness underwent a detailed questionnaire regarding history and were assessed about the onset, duration and position at which patient developed vertigo. All patients underwent otological examination, vestibular function tests. Patients who were taking any labyrinthine sedatives were advised to stop these 3 days prior to the examination.

Dix Hallpike positional test was done as per the clinical guidance. The patient is seated along the couch, feet up and the head is turned 45 degrees towards the side being tested, aligning the vertical canals with the sagittal plane. The head is brought down briskly over the end of the couch to lie 30 degrees below the horizontal while maintaining a position 45 degrees to the side being tested. Patients should be counselled prior to the test about dizziness but that they are to try and maintain their eyes open for examination. Eye movements were directly visualised without the aid of defocusing glasses.

Patients who had torsional nystagmus on Dix-Hallpike test, fulfilled the inclusion criteria and gave written consent were included in the study from August 2018 to July 2019.

After diagnosing the posterior canal BPPV, a detailed history was taken and proforma was filled including the age, gender, affected side, duration of vertigo, duration of vertigo attack, associated co-morbidities like hypertension, diabetes mellitus, etc. Also the quality of life assessed using Dizziness handicap inventory (DHI) scoring which included emotional, functional and physical scores.

After diagnosing of posterior canal BPPV via positive Dix-Hallpike test, Patients underwent Epley's manoeuvre. The patient is seated longitudinally on the couch facing away from the examiner and brought down with the head

turned by 45 degrees to the affected side and extended over the edge of the table for 30–60 s. The head is then turned 90 degrees to the opposite side for 30–60 s. The head is then rotated a further 90 degrees with the body also rotated to 90 degrees so that the patient is looking obliquely downwards for another 30–60 s. The patient is then asked to swing their legs over the side of the couch in anticipation of the next step which involves the patient being brought to the sitting position with the head turned 45 degrees to the unaffected side for 20 s. The manoeuvre finishes with the patient in the sitting position.

Then patient had every week follow up for 4 weeks and then monthly for 6 months and patient was advised to consult immediately in case of symptoms. The efficacy of the treatment was assessed as:

1. Conversion of positive to negative Dix Hall pike manoeuvre.
2. Subjective relief in vertigo in terms of duration and frequency of episodes of vertigo.
3. Dizziness handicap inventory (DHI) scoring for assessing quality of life.

Those patients in whom vertigo was not resolved, Epley's manoeuvre was repeated.

Statistical analysis done by using paired t test.

Results

Out of 120 patients, maximum number of patients were in the elder age group (above 40yrs) 38(31.67%) between 51 and 60 yrs and 32(26.67%) between 41 and 50yrs whereas 21(17.5%) in the age group of 18–30 years and 29(24%) between 31 and 40 years. Mean age was 43.5 yrs. 63(52.5%) females and 57(47.5%) males were affected. Left side posterior canal found to be more commonly affected than the right side. 69(57.5%) had left canal involvement and 51(42.5%) had right canal involvement. Associated co-morbidities are shown in Table 1 showing

hypertension to be the most common associated co-morbidity.

Number of sessions required by the patients for getting complete relief and their association with the age, gender and duration of vertigo is shown in Table 2 and the association was found to be non-significant for both age and gender and significant association found with the duration of vertigo.

After the Epley's manoeuvre, significant ($p < 0.0001$) change in duration of vertigo attack found before and after the manoeuvre shown in Fig. 1. Epley's manoeuvre also lead to significant ($p < 0.0001$) change in frequency of episodes of vertigo after the manoeuvre shown in Fig. 2

We assessed the quality of life in terms of DHI scoring. A significant decrease in DHI scoring found before and after the manoeuvre shown in Fig. 3.

The follow up was of 6 months duration, so we also found recurrences. 10 patients presented with recurrence after getting complete relief from manoeuvre. Table 3 shows recurrence and its association with age, gender and duration of vertigo attack with age and gender having non-significant associations and duration of vertigo attack having significant association with BPPV recurrence. Patients with recurrence having torsional nystagmus on Dix- Hallpike test were treated with Epley's manoeuvre.

Discussion

BPPV was first described by Barany as an otolith disease in 1921 and later described in more detail by Dix and Hallpike with the classic positioning to induce nystagmus as the diagnostic test [13, 14]. This manoeuvre relocates free floating particles from the posterior semicircular canal back into utricle, thus relieving the symptoms of vertigo.

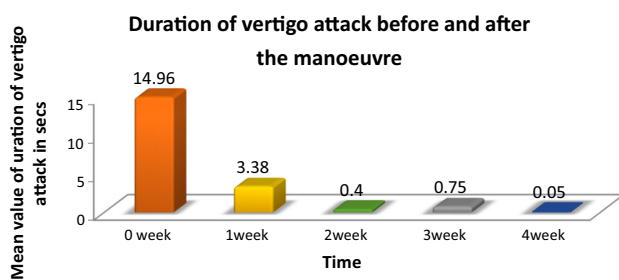
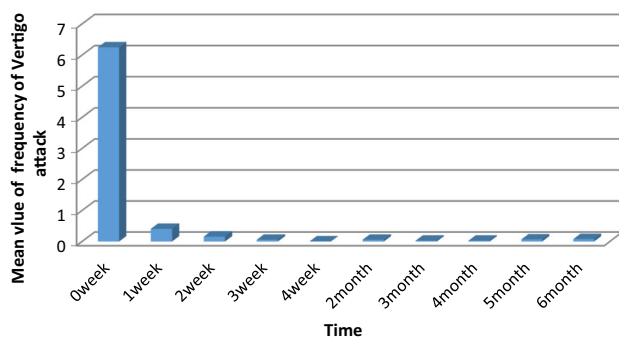
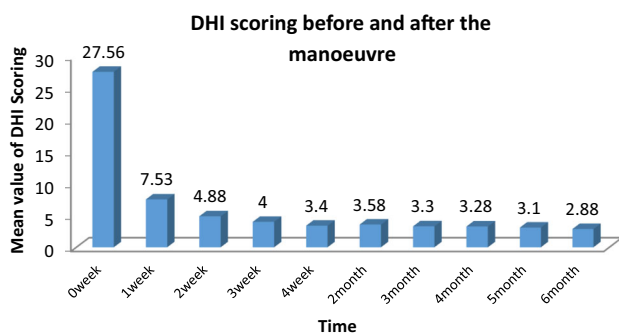
Present study comprised of 120 patients, mean age was 43.5yrs similar to the study done by Herman guild [15]. BPPV affects all age groups, though it appears to be more common in the elderly. Increased use of medications and the increased prevalence of chronic disorders with the age

Table 1 Associated Co-morbidities

Co-Morbidities	No. of patients	Percentage
Head Trauma	6	5.00
Hypertension	20	16.67
Diabetes Mellitus	5	4.17
Hypothyroidism	10	8.33
Migraine	3	2.50
Hyperlipaemia	4	3.33
CSOM	10	8.33

Table 2 Number of sessions of Epley's manoeuvre required and their association with age, gender and duration of vertigo

		Number of sessions				
		1	2	3	4	
Patients		108(90%)	7(5.83%)	2(1.67%)	3(2.5%)	
Age	< 40yrs	48(40%)	2(1.6%)	0(0%)	1(0.8%)	$p = 0.220$
	> 40yrs	60(50%)	5(4.1%)	2(1.6%)	2(1.67%)	
Gender	Male	55(45%)	1(0.8%)	0(0%)	1(0.8%)	$p = 0.129$
	Female	53(44%)	6(5%)	2(1.6%)	2(1.6%)	
Duration of vertigo(in months)	< 1	60(50%)	0(0%)	0(0%)	0(0%)	$p = 0.006$
	1–12	39(32%)	5(4%)	1(0.8%)	2(1%)	
	12–24	5(4%)	2(1%)	1(0.8%)	1(0.8%)	
	> 24	4(3%)	0(0%)	0(0%)	0(0%)	

**Fig. 1** Duration of vertigo attack before and after the manoeuvre**Fig. 2** Change in frequency of episodes of vertigo before and after the manoeuvre**Fig. 3** DHI scoring before and after the manoeuvre

increases the chances of development of dizziness in the elder population. Also the chances of detachment of otoconia increases with the age due to increased degenerative changes in elders.

BPPV is more common in females than in males [16]. In present study also, 63(52.5%) were female. Gaur S et al. also found a predilection for females (66%) [17]. Decreased oestrogen levels may detach the otoconia from their matrix by disturbing the internal structure of otoconia leading to positional vertigo. However, Sundararajan [18] found the BPPV to be more common in males (63%) and found no significant association with either age or sex.

Concerning the side of the involved canals, we found 69(57.5%) left side posterior canals involvement and 51(42.5%) right side posterior canals involvement which is similar to the study by Ana Paula et al. [19] whereas M. Von Brevern 89 found that BPPV affects predominantly the right labyrinth.

BPPV can be associated with other conditions also. Hypertension, diabetes, hyperlipidaemia were also suggested as the predisposing factors for BPPV. In present study, hypertension was the most common, found in 20 patients (16%) followed by hypothyroidism and CSOM, each found in 10 patients (8.33%) It could be due to the labyrinthine ischemia that facilitates detachment of otoconia from otolith membrane. Similarly in the study by Gaur S et al. [7], hypertension and diabetes were found among 18 (36%) participants.

Migraine also has been found to be in close association with BPPV. In present study, migraine was diagnosed in 5(2%) of total patients. Hanna Hussain et al. study reported strong association of BPPV with migraine. [20] In migraine vasospasm of labyrinthine arteries occurs which may change the inner ear blood flow resulting in the release of otoliths.

Table 3 Association of recurrence of BPPV with age, gender and duration of vertigo attack

		Patients with recurrence	Patients without recurrence	
Age	< 40yrs	2	50	$p = 0.328$
	> 40yrs	8	70	
Gender	Male	4	57	$p = 0.746$
	Female	6	63	
Duration of vertigo attack(seconds)	< 15 s	3	80	$p = 0.007$
	> 15 s	7	40	
Duration of vertigo(months)	< 1	4	56	$p = 0.455$
	1–12	6	59	
	12–24	0	9	
	> 24	0	4	

Head trauma is among the most common causes of BPPV and contributes 14.5–18% [16]. It can involve more than one canal. In present study, only one case reported with the vertigo following a head trauma and got relief after 4 sessions of Epley's manoeuvre. In head trauma, the injury force may cause the otoconia to release in the endolymph.

Present study showed 90% efficacy at 1st week, 95% at 2nd week. 97% at 3rd week and 100% at 4th week which is similar to previous studies done by Gaur S et al. [17], Lynn et al. [5]. Epley's reported 80% success rate after a single treatment and 100% when there was more than 1 treatment session.

In present study, we did not give any medications to the patients previously on medication before giving Epley's manoeuvre and they were found to be relieved by the manoeuvre alone. Use of labyrinthine sedatives does not improved the treatment outcome along with the Epley's manoeuvre. Reasons that could explain these findings are that these labyrinthine sedatives prolongs the central compensation in cases of peripheral vestibular injury so increases the delay in recovery. On sedating the labyrinth, signals sent by the labyrinth to the brain get attenuated thus delays the recovery process despite the particle repositioning done by the Epley's manoeuvre.

A prolonged duration of symptoms indicates that disease may be advanced and thus difficult to treat. In present study also, duration of symptoms had significant ($p = 0.006$) role in determining the number of sessions required for getting complete relief. On subjecting the predictors identified by univariate analysis on multivariate regression analysis, the significant factors predicting 1 week outcome were duration of the symptoms and the treatment type. Whereas on similar analysis at 4 week outcome, the only significant factor was symptom duration alone [21].

An overlooked important aspect of the BPPV is its impact on the quality of life, daily activity and the

improvement achieved after the manoeuvre. We used DHI scoring in measuring the effect of Epley's manoeuvre in improving the quality of life of patients suffering from BPPV. It comprised of a questionnaire covering the physical, emotional and functional aspects. It was applied before and after the manoeuvre and a significant difference in scoring was found showing that Epley's manoeuvre has a significant role in improving the quality of life of patients.

In BPPV short term recurrence rates are 7–23% within a year of treatment and long term recurrence may reach 50% depending on the age of the patient [22]. In present study, 10(12%) recurrence rate has been found in a follow up of 6 months. Although no significant association with the age and gender was found but duration of vertigo attack had significant association with the recurrence of BPPV..Choi et al. reported BPPV recurrence in 12.5% of cases [23]. Brandt et al. [24] reported that recurrences were seen significantly more often in women and also in patients in their seventh decade. He also suggested that a history of three or more BPPV attacks prior to treatment might be an indicator for BPPV recurrence. no significant association with the age and gender but duration of vertigo attack significant association with the recurrence of BPPV.

Conclusion

We found that Epley's Manoeuvre is an effective and very efficient modality of treatment for the patients suffering from posterior canal BPPV. We strongly recommend it as the first line of treatment. Those patients of BPPV who were not responding with labyrinthine sedatives also got relieved on treating with only the Epley's manoeuvre. It significantly improved the Quality of life of BPPV patients. Awareness should be made in the community and also among the clinicians regarding referral of these patients to

the ENT specialists. ENT specialists also should be able to identify the BPPV patients by its characteristic clinical history and should perform Epley's manoeuvre in posterior canal BPPV and prescribing long term labyrinthine sedatives must be discouraged.

References

- Furman J, Cass S (1999) Benign paroxysmal positional vertigo. *N Engl J Med* 341(21):1590–1596
- Parnes LS, Agrawal SK, Atlas J (2003) Diagnosis and management of Benign paroxysmal positional vertigo. *Can Med Assoc J* 169:681–693
- Froehling D, Bowen J, Mohr D, Breyr, Beatty C, Wollan P et al (2000) The canalith repositioning procedure for the treatment of benign paroxysmal positional vertigo: a randomized controlled trial. *Mayo Clinic Proceedings*. 75(7): 695–700.
- von Brevern M, Radtke A, Lezius F et al (2007) Epidemiology of benign paroxysmal positional vertigo: a population based study. *J Neurol Neurosurg Psychiatry* 78:710–715
- Lynn S et al (1995) Randomized trial of the canalith repositioning procedure. *Otolaryngol-Head Neck Surg* 113(6):712–720
- Burton MJ, Eby TL, Rosenfeld RM (2012) Extracts from the cochrane Library: modifications of the Epley (canalith repositioning) maneuver for posterior canal benign paroxysmal positional vertigo. *Otolaryngol-Head Neck Surg Off J Am Acad Otolaryngol-Head Neck Surg*. 147(3):407–11.
- Davies RA, Luxon LM (1995) Dizziness following head injury: A neuro-otological study. *J Neurol*. 1;242(4):222–30.
- Hornibrook J (1998) Immediate onset of positional vertigo following head injury. *N Z Med J*. 11;111(1073):349.
- Harada K, Oda M, Yamamoto M, Nomura T, Ohbayashi S, Kitsuda C (1993) A clinical observation of benign paroxysmal positional vertigo(BPPV) after vestibular neuronitis(VN).*Acta Oto-Laryngol Suppl*.503:61–3.
- Gyo K (1988) Benign paroxysmal positional vertigo as a complication of postoperative bedrest.*The laryngoscope*. 1; 98:332–3.
- Moon SY, Kim JS, Kim B-K, Kim JI, Lee H, Son S-I, et al. (2006) Clinical characteristics of Benign Paroxysmal Positional Vertigo in Korea: A multicentre Study. *J Korean Med Sci*. 21(3):539–43.
- Nuti D, Mandala M, Salerni L (2009) Lateral canal paroxysmal positional vertigo revisited.*Ann N Y Acad Sci*. 1164:316–23.
- Epley JM (1992) The canalith repositioning procedure: for treatment of benign paroxysmal positional vertigo.*Otolaryngol—Head Neck Surg Off J am Acad Otolaryngol-Head Neck Surg*. 107(3):399–404.
- Woodworth B, Gillespie M, Lambert P (2004) The Canalith Repositioning Procedure for Benign Positional Vertigo:A meta – analysis .*Laryngoscope*. 114(7) :1143–6.
- Manayil John H, John A (2016) Efficacy of Epley's manoeuvre in posterior canal benign paroxysmal positional vertigo. *J Evid Based Med Healthc* 3(102):5624–5627
- Baloh RW, Honrubia V, Jacobson K (1987) Benign positional vertigo: clinical and oculographic features in 240 cases. *Neurol* 37(3):371–378
- Gaur S, Awasthi S, Bhadouriya S, Saxena R, Pathak V, Bisht M (2015) Efficacy of epley's maneuver in treating bppv patients: a prospective observational study. *Inter J Otolaryngol* 2015:1–5
- Sundararajan I, Rangachari V, Sumathi V, Kumar K (2011) Epley's manoeuvre versus Epley's manoeuvre plus labyrinthine sedative as management of benign paroxysmal positional vertigo: prospective, randomised study. *J Laryngol Otol* 125(6):572–575
- André A, Moriguti J, Moreno N (2010) Conduitas pós-manobra de Epley em idosos com VPPB de canal posterior. *Braz J Otorhinolaryngol* 76(3):300–305
- Elsanadiky H, Nour Y (2015) Diagnosis and management of posterior semicircular canal benign paroxysmal positional vertigo: A practical approach. *Egypt J Ear, Nose, Throat Allied Sci* 16(2):161–166
- Imai T, Okumura T, Sato T, Takeda N, Ohta Y, Okazaki S et al (2019) Effects of Interval Time of the Epley Maneuver on Immediate Reduction of Positional Nystagmus: A Randomized, Controlled, Non-blinded Clinical Trial. *Frontiers in Neurology*. 10.
- V vijayraj (2018) A comparison between the effect of Epley's maneuver and Brandt-daroff exercise in improving the quality of life (QOL) in patients with benign paroxysmal positional vertigo (BPPV). *Inter J Appl Dent Sci*. 4(2):228–237.
- Choi SJ, Lee JB, Lim HJ et al (2012) Clinical features of recurrent or persistent benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg* 147:919–924
- Brandt T, Huppert D, Hecht J, Karch L, Strupp M (2006) Benign paroxysmal positional vertigo: A long term follow-up(6–17 years) of 125 patients. *Acta Otolaryngol* 126:160–163

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.