



TO STUDY THE EFFECTIVENESS OF SEMONT EXERCISE BY DIX HALLPIKE'S TEST AND ACTIVITY SPECIFIC BALANCE CONFIDENCE SCALE IN BENIGN PAROXYSMAL POSITIONAL VERTIGO IN PATIENTS AGED 45 TO 65 YR'S.

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Abstract

Title: To study the effectiveness of Semont exercise by Dix Hallpike's test and Activity Specific Balance Confidence scale in Benign Paroxysmal Positional Vertigo in patients aged 45 to 65 yr's.

Aim of the study: To know the effectiveness of Semont exercise by Dix Hallpike's test and Activity Specific Balance Confidence scale in Benign Paroxysmal Positional Vertigo in patients aged 45 to 65 yr's.

Methodology: In this study 16 subjects were taken and pre-assessed with Dix Hallpike's Test and Activity Specific Balance Confidence scale. They were then given Semont Exercise for 3 weeks (twice a day, 4 repetitions per session) and again assessed post-interventionally by Dix Hallpike's Test and Activity Specific Balance Confidence scale. The results were calculated statistically.

Design and setting: Experimental Interventional study in Multispecialty hospital set up.

Result: The comparisons of the pre-test and post-test means of the ABC scale were done by the paired t test. The pre-test average score was 43.05% of confidence with standard deviation of 10.29. The post-test average score was 56.14% of confidence with standard deviation of 16.40. The test statistics value of the paired t test was 4.72 with p value 0.00. The p value less than 0.05 Concludes that, there was significant difference in pre and post-test level of ABC scale. In comparison between pre-interventional Vs post-interventional Dix-Hallpike's result. Out of total 16 subjects no subject had absence of nystagmus pre-interventionally while 2 subjects had absence of nystagmus post-interventionally, 3 subjects had mild nystagmus pre-interventionally while 7 subjects had mild nystagmus post-interventionally, 8 subjects had moderate nystagmus pre-interventionally while 6 subjects had moderate nystagmus

post-interventionally, 5 subjects had severe nystagmus pre-interventionally while 1 subject had severe nystagmus post-interventionally, which concludes significant relief in symptoms of BPPV.

Conclusion: This study concludes that the Semont Exercise is beneficial in BPPV patients as it showed significant value in the result.

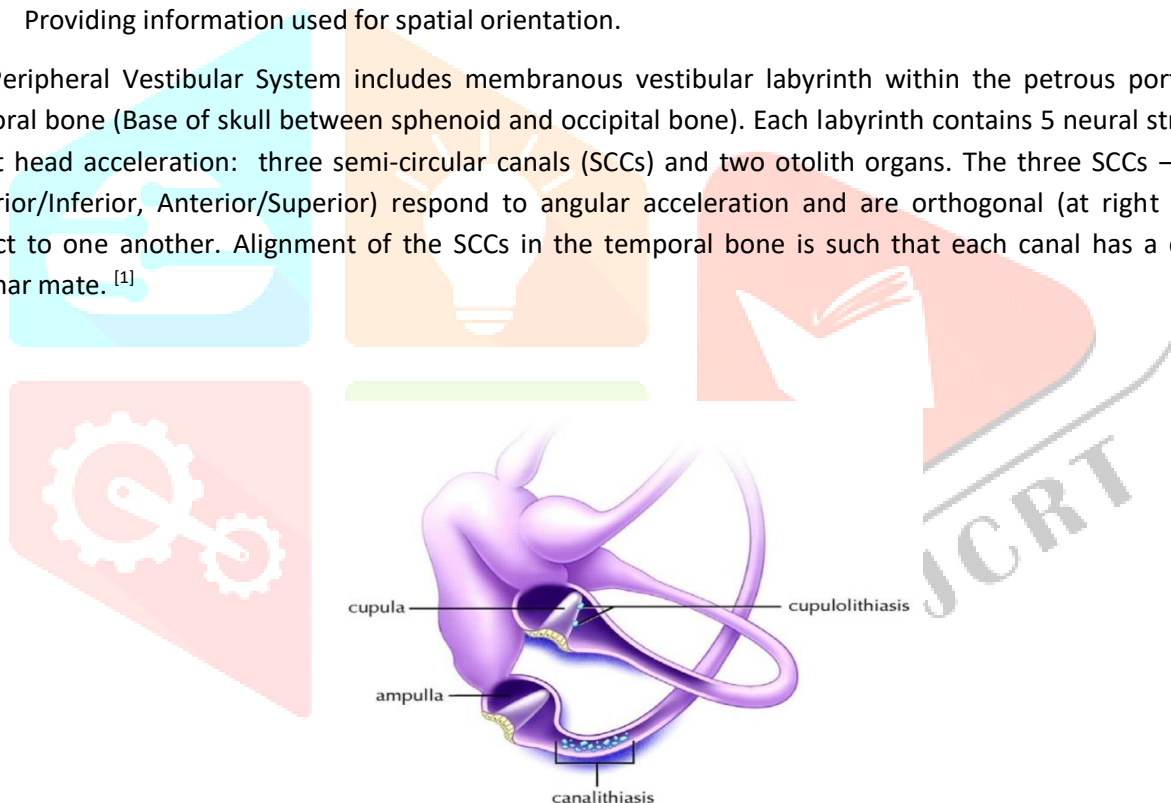
Keywords: ABC Activity Specific Balance Confidence Scale, BPPV, Benign Paroxysmal Positional Vertigo, Dix Halpike's test, Semont Exercise.

Introduction

Human body functions are controlled by few organ systems. One of them is Vestibular system which is responsible for balance, sensory integration of joint position sense supplied by 8th cranial nerve i.e vestibulo-cochlear nerve. Three primary functions of peripheral vestibular system are –

- 1) Stabilizing visual images on the fovea of retina during head movements to allow clear vision,
- 2) Maintaining postural stability, especially during head movements and,
- 3) Providing information used for spatial orientation.

Peripheral Vestibular System includes membranous vestibular labyrinth within the petrous portion of each temporal bone (Base of skull between sphenoid and occipital bone). Each labyrinth contains 5 neural structures that detect head acceleration: three semi-circular canals (SCCs) and two otolith organs. The three SCCs – (Horizontal, Posterior/Inferior, Anterior/Superior) respond to angular acceleration and are orthogonal (at right angles) with respect to one another. Alignment of the SCCs in the temporal bone is such that each canal has a contralateral coplanar mate. ^[1]



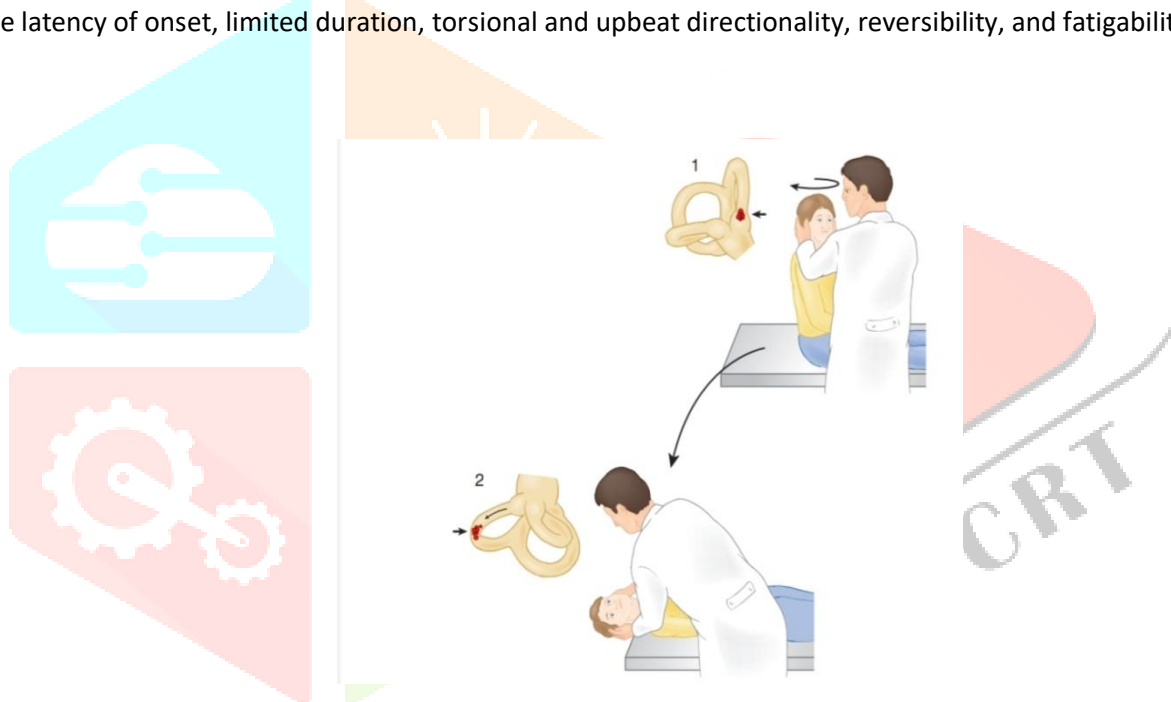
The SCCs are filled with endolymph (fluid) that has a density slightly greater than water. Endolymph moves freely within each canal in response to the direction of the angular head rotation. The SCCs enlarge at one end to form the ampulla. Within the ampulla lies the cupula, a gelatinous barrier that contains the sensory hair cells. The saccule and utricle make up the otolith organs of the membranous labyrinth and respond to linear acceleration and static head tilt. Sensory hair cells project into a gelatinous material that has calcium carbonate crystalline-structure material (otoconia) embedded in it, which provides the otolith organs with an inertial mass ^[1]

BPPV was first described by Barany in 1921, and he attributed the disorder to otolith disease ^[2]. The clinical diagnosis of this disorder was not well defined until Dix and Hallpike described the classic positioning which causes a characteristic nystagmus ^[3]. Benign paroxysmal positioning vertigo is a disorder characterized by brief attacks of vertigo (Sensation of the environment being spinning around by oneself), with associated nystagmus (Rapid involuntary movement of eyes), and precipitated by certain changes in head position with respect to gravity. ^[4]

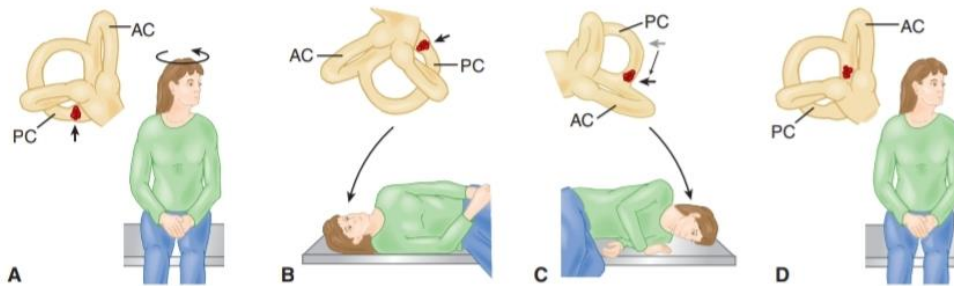
In most cases of BPPV, no specific etiologic disorder can be identified. The most common known cause is closed head injury, followed by vestibular neuritis. BPPV eventually develops in nearly 15% of patients suffering from vestibular neuritis. Other cited predisposing events include infections and certain surgical procedures, including stapedectomy and insertion of a cochlear implant [5]. Prolonged bed rest and Meniere's disease are also predisposing factors. [6]

The annual incidence of this disease is estimated at 64 cases per 1,00,000 people. [7] Mechanical disorder in the posterior semicircular canal has been reported to be the most common one (Posterior canal BPPV), while impairment stemming from the horizontal and anterior semicircular canal (Horizontal and Anterior canal BPPV) is much rarer. [8]

BPPV can be clinically provoked using "triggering maneuvers" as described by Dix and Hallpike [9]. The Dix-Hallpike maneuver is the definitive test for BPPV. The maneuver begins with the patient seated and head turned 45 degrees to the side being tested so as to isolate and vertically orient that side's posterior canal. The patient is then laid back into a supine position with the tested ear down. Classic teaching suggests hanging the head back over the edge of the bed, but this is not necessary when performing the Dix-Hallpike test alone. Overextension of the neck may even elicit a false positive response from the contralateral side. With a convincing clinical history, a diagnosis of BPPV is made if the Dix-Hallpike maneuver provokes the appropriate nystagmus. Characteristic nystagmus features include latency of onset, limited duration, torsional and upbeat directionality, reversibility, and fatigability. [10].



Pathophysiology of BPPV may be explained with two currents: cupulolithiasis and canalithiasis. In cupulolithiasis, degenerated otoconia in the utricle adhere to the cupula of the semicircular canal, making it denser than the surrounding endolymph, and thus more susceptible to the effects of gravity. The canalithiasis theory contends that degenerated otoconia do not adhere to the cupula, but remain floating in the endolymph of the posterior canal. In both theories, head movements cause the fragments to move, which stimulates the cupula of semicircular canal inappropriately and excites the ampullary nerve, resulting in vertigo. There are several approaches to treat BPPV, such as vestibular habituation exercises, vestibular sedatives, destructive surgeries, and repositioning maneuvers. Maneuvers have been more widely adopted than the former methods. Epley, Semont maneuvers and Brandt–Daroff Exercise are used for treatment of BPPV. Semont maneuver is liberatory maneuver. In Semont maneuver patient is seated on examination table with legs hanging and head rotated 45 degrees horizontally towards the unaffected ear. Thereafter the patient is tilted 105 degrees such that the patient is lying on the side of the affected ear with head hanging and nose pointed upward. Patient remains in this position for around 3 min—allowing debris to move to the apex of the ear canal. Then patient is moved quickly from the seated position, holding head in place, until patient is lying on the side of the unaffected ear with patient's nose pointed to the ground. Patient remains in this position for 3 min allowing the debris to move toward the exit of the ear canal. Then patient is moved slowly back to the seated position. The aim of exercise is that the debris should fall into the utricle of the canal, where it will no longer cause vertigo sensations. [11]



Activities-specific balance confidence (ABC) scale is a structured questionnaire that measures an individual's confidence during ambulatory activities without falling or experiencing a sense of unsteadiness. It was developed in 1995 by Powell and Myers, and consists of 16 questions gauging the individual's confidence while doing activities. ^[12].

BPPV generally occurs in all ages but most commonly in middle age and old age population. The consequences of vertigo may lead to fall and serious injury. Also rate of recovery is inversely proportional to the age. Thus BPPV reduces the independence level and confidence of a person making her/him stuck in home and dependent on caregivers for ambulation.

There are many exercises for BPPV such as Epely's maneuver, Semont exercise and Brandt and Darroff. Many studies proved Epley to be the most effective one, than semont and then Bandtaroff.

I have chosen Semont Exercise since Semont exercise can be performed by the person herself/himself once perfectly taught by the therapist.

Thus studying the effectiveness of Semont exercise in reducing symptoms of BPPV in patient aged 45 to 65 yr's and to study the outcome result by Dix Hallpike's test and Activity Specific Balance Confidence scale will aid in better treatment and prognosis of BPPV patient.

OBJECTIVES

1. To assess the patients for BPPV by Dix Hallpike's test and by Activity Specific Balance Confidence Scale.
2. To study the effect of Semont Exercise on BPPV.
3. To study the outcome result by comparing the pre- interventional and post- interventional by Dix Hallpike's test.
4. To study the outcome result by comparing the score of pre- interventional and post- interventional by Activity Specific Balance Confidence Scale.

Material and Methodology

- Material Required
 - Evaluation Sheet.
 - Stationary material
 - Consent form.
 - Activity Specific Balance Confidence Scale.
- Sample Size - 16
Sample size was calculated from mother article by the formula

$$n = \frac{Z_1^2 S^2}{d^2}$$

Where M = mean = 2.42

Z1 = 1.96 at $\alpha = 5\%$ level of significance

S = 0.20 = Standard deviation.

d = absolute precision

= 0.10

$$n = \frac{(1.96)^2 (0.20)^2}{(0.10)^2}$$

n = 16 (Sample Size)

- Study Place – Multispecialty hospital setups.
- Study Design - Interventional Study.
- Study Duration – 6. Months
- Outcome Measure – Dix Hallpike's test, ABC Scale (Activity Specific Balance Confidence scale)

Selection Criteria

Inclusion Criteria:

- Age from 45 to 65 years.
- Both male and female gender.
- Subjects having positive Dix Hallpike's test (all grades) confirming the diagnosis of BPPV.
- Subjects with informed consent.

Exclusion Criteria:

- Vertigo due to other pathologies besides BPPV.
- Medical history of diabetes and hypertension.
- History of spinal problems like spondylitis.

Hypothesis

Hypothesis (H1):

Semont Exercise was found to be beneficial in reducing symptoms of BPPV patients on assessment by Dix-Hallpike's Test and ABC Scale

Null Hypothesis (H0):

Semont Exercise was not found to be beneficial in reducing symptoms of BPPV patients on assessment by Dix-Hallpike's Test and ABC Scale.

Procedure:

To conduct the following study approval was taken from institutional ethical committee and the Principal of Dr. Ulhas Patil College of Physiotherapy, Jalgaon. Subjects were taken as per the inclusion and exclusion criteria and the procedure was explained and a written consent was obtained from the subjects; the participants who signed the consent form were taken in the study.

29 Elderly having complaint of vertigo were screened for the inclusion and exclusion criteria, 13 out of which were not taken for the study since they did not match the inclusion criteria. While 16 of them fulfilled the inclusion criteria hence they were taken for the study among whom 8 were females while 8 were males

This experimental interventional study was done in 2 sessions (Pre-interventional Session and Post-interventional Session) having gap of 3 weeks in between. All the subjects were assessed by the standard evaluation sheet designed for this study, which includes demographic data, Dix Hallpike's test and ABC Scale Score.

Pre-interventional Assessment: The subjects were assessed with Dix Hallpike's test and the severity of nystagmus was observed and noted. Thereafter ABC Scale questionnaire was explained to the subjects in their

regional language and the ABC scale score was obtained. Semont Exercise was taught to the subjects and made to practice under observation. Semont exercise chart and follow-up sheet was handed over to the subjects. Semont exercise was prescribed for 3. Weeks twice a day(4times per session) 6. days per week.

Post-interventional Assessment: The subjects were assessed with Dix Hallpike's test and the severity of nystagmus was observed and noted. Thereafter ABC Scale questionnaire was explained to the subjects in their regional language and the ABC scale score was obtained. Follow-up sheet was checked. Pre and Post results were analysed and compared.

Result

- In age wise distribution, the mean age is found to be 54 years with standard deviation of 6.17.
- Gender wise 50% males while 50% female. Out of total 16 subjects 8 were females while 8 were males.
- In pre-interventional Dix-Hallpike's result. Out of total 16 subjects 3 had mild nystagmus 8 had moderate nystagmus while 5 had severe nystagmus when assessed pre-interventionally.
- In post-interventional Dix-Hallpike's result. Out of total 16 subjects 2 had absence of nystagmus, 7 had mild nystagmus, 6 had moderate nystagmus while 1 had severe nystagmus when assessed post-interventionally.
- In comparison between pre-interventional Vs post-interventional Dix-Hallpike's result. Out of total 16 subjects no subject had absence of nystagmus pre-interventionally while 2 subjects had absence of nystagmus post-interventionally, 3 subjects had mild nystagmus pre-interventionally while 7 subjects had mild nystagmus post-interventionally, 8 subjects had moderate nystagmus pre-interventionally while 6 subjects had moderate nystagmus post-interventionally, 5 subjects had severe nystagmus pre-interventionally while 1 subject had severe nystagmus post-interventionally, which concludes significant relief in symptoms of BPPV.
- The comparisons of the pre-test and post-test means of the ABC scale were done by the paired t test. The pre-test average score was 43.05% of confidence with standard deviation of 10.29.
- The post-test average score was 56.14% of confidence with standard deviation of 16.40.
- The test statistics value of the paired t test was 4.72 with p value 0.00.
- The p value less than 0.05 Concludes that, there was significant difference in pre and post-test level of ABC scale.

Discussion

The primary aim of this study was to study the effectiveness of Semont exercise in Benign Paroxysmal Positional Vertigo in patient aged 45 to 65 years. According to the previous study "Effect of Epley, Semont Maneuvers and Brandt-Daroff Exercise on Quality of Life in Patients with Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo (PSCBPPV)" by the author Ashok Kumar Gupta, Kumar Gourav Sharma conducted in 2017, BPPV affects all age group but it's generally observed in older age group individual, the mean age was 50 years.

The findings of a previous study "Efficacy of Epley's Maneuver in Treating BPPV Patients: A Prospective Observational Study conducted by Sushil Gaur, Sanjeev Kumar Awasthi, Sunil Kumar Singh Bhadouriya, revealed that the mean age was 53 years with standard deviation of 13.

In this study it is observed that the mean age of subjects is 54 years with standard deviation of 6.17 which is in correlation with previous studies. ^[11] ^[13]. In present study the male and female gender-wise prevalence of BPPV was 50% female and 50% male. While in previous studies the gender distribution was 65% female and 35% male ^[11] and few studies showed female to male ratio higher i.e 75-85%. ^[20] ^[21]

Present study revealed a significant difference between pre and post treatment assessment done by means of Dix Hallpike's test and ABC Scale. In this study the semont exercise had positive effect on the lives of patients having BPPV. This finding was consistent with the other studies assessing QOL using other scales such as VAP (Vestibular Activities And Participation Scale) DHI (Dizziness Handicap Inventory Scale)

The functional aspect investigate the effect of dizziness on specific eye, head and body movements focusing on the subject's ability to carry out professional, household, social and leisure activities and her/his

independence while performing specific task such as walking independently. The Gold standard test for diagnosis and evaluation of the efficacy of treatment in BPPV is Dix Hallpike's test. After treatment if no nystagmus is observed, it suggest that dislodged otoconia are repositioned in the utricle and indicates physiological improvement in patient.

In present study the pre and post treatment assessment done by means of ABC Scale revealed that the patients were independently recovered and confident enough to perform their ADLs independently. Most of the studies did comparison between BPPV affecting left side and right side and found the left side to be more involved i.e 40% of right sided while 60% of left sided.^[13] On contrary to this the present study found right side to be more involved – Right Ear BPPV: 50%, Left Ear BPPV:25% and Bilateral Ear BPPV:25%.

Conclusion

- Results of Dix Hallpike test and ABC Questionnaire correlated with each other. According to the results it can be concluded that the Semont exercise shows improvement in relieving the symptoms of BPPV.
- It suggests that prognosis at physiological level and prognosis in all dimensions of QOL are directly proportional to each other.
- Present study concludes that, Semont Exercise is effective in the duration of 3 weeks (Twice a day, 4 times/session, 6 days/week) with medication in recovering from the symptoms of BPPV.

References

1. Physical Rehabilitation – Susan B. O'Sullivan. Thomas J. Schimtz. George D. Fulk Sixth Edition.
2. E. Bar´ any, "Diagnose von krankheitserscheinungen im bereiche ´ des otolithenapparates," Acta Oto-Laryngologica, vol. 2, no. 3, pp. 434–437, 1920.
3. M. R. Dix and C. S. Hallpike, "The pathology, symptomatology and diagnosis of certain common disorders of the vestibular system," Annals of Otology, Rhinology & Laryngology, vol. 61, no. 4, pp. 987–1016, 1952.
4. L. S. Parnes, S. K. Agrawal, and J. Atlas, "Diagnosis and management of benign paroxysmal positional vertigo (BPPV)," Canadian Medical Association Journal, vol. 169, no. 7, pp. 681– 693, 2003.
5. M. Viccaro, P. Mancini, R. La Gamma, E. De Seta, E. Covelli, and R. Filipo, "Positional vertigo and cochlear implantation," Otology & Neurotology, vol. 28, no. 6, pp. 764–767, 2007.
6. E. M. Gross, B. D. Riss, E. S. Viirre, J. R. Nelson, and J. P. Harris, "Intractable benign paroxysmal positional vertigo in patients with Meniere's disease," Laryngoscope, vol. 110, no. 4, pp. 655– 659, 2000
7. Froehling DA, Silverstein MD, Mohr DN, BeattyCW, OffordKP, Ballard DJ. Benign Positional Vertigo, Mayo Clin proc. 1991; 66:596-601.
8. Honrubia V, Baloh RW, Harris MR, Jacobson KM. Paroxysmal Positional Vertigo Syndrome. AM J Otol. 1999; 20:465-470.
9. Dix MR, Hallpike CS. The pathology, symptomatology and diagnosis of certain common disorders of vestibular system. Ann Otol Rhinol Laryngol, 1952; 61:987-1016.
10. **Peng You, MD; Ryan Instrum, MD; Lorne Parnes, MD,FRCSC (2018):** Conducted a study titled Benign Paroxysmal Positional Vertigo.
11. **Ashok Kumar Gupta1 • Kumar Gourav Sharma Pritosh Sharma (2018):** Conducted a study titled Effect of Epley, Semont Maneuvers and Brandt–Daroff Exercise on Quality of Life in Patients with Posterior Semicircular Canal Benign Paroxysmal Positional Vertigo (PSCBPPV).
12. Moiz JA, Bansal V, Noohu MM, Gaur SN, Hussain ME, Anwer S, Alghadir A. Activities-specific balance confidence scale for predicting future falls in Indian older adults. Clin Interv Aging. 2017 Apr 10;12:645-651. Doi: 10.2147/CIA.S133523. PMID: 28435236; PMCID: PMC5391867.
13. **Sushil Gaur, Sanjeev Kumar Awasthi, Sunil Kumar Singh Bhadouriya (2015):** Conducted a study titled Efficacy of Epley's Maneuver in Treating BPPV Patients: A Prospective Observational Study.
14. **Michael Strupp 1, Nicolina Goldschagg, Anne-Sophie Vinck 2 , Otmar Bayer 1,3 (2021):** Conducted a study titled BPPV: Comparison of the SémontPLUS With the Sémont Maneuver: A Prospective Randomized Trial

15. **PUNIA SONU, SHARMA SUJATA, BEHL JAGRITI, CHATURVEDI REKHA (2015):** Conducted a study titled, Benign paroxysmal positional vertigo: Pathophysiology, Causes, Canal Variants and Treatment
16. **Achyutha Kiran Kumar¹ Kattela Suneel Kumar² G Hari Babu³ Keertana⁴ (2014):** Conducted a study titled, The Effectiveness Of Semont Liberatory Maneuver In Acute Benign Paroysmal Positional Vertigo Patients.
17. **Jeremy Hornibrook (2011):** Conducted a study titled Benign Paroxysmal Positional Vertigo (BPPV): History, Pathophysiology, Office Treatment and Future Directions Jeremy.
18. **Janet Odry Helminski, PhD; Imke Janssen, PhD; Despina Kotaspuikis, DPT; Karen Kovacs, MPT (2005):** Conducted a study titled Strategies to Prevent Recurrence of Benign Paroxysmal Positional Vertigo.
19. **Emmanuel Levrat, MD; Guy Van Melle, PhD (2003):** Conducted a study titled Efficacy of the Semont Maneuver in Benign Paroxysmal Positional Vertigo.
20. S. S. U. Waleem, S. M. Malik, S. Ullah, and Z. ul Hassan, "Office management of benign paroxysmal positional vertigo with Epley's maneuver," Journal of Ayub Medical College, Abbottabad, vol. 20, no. 1, pp. 77–79, 2008.
21. L. J. Teixeira and J. N. P. Machado, "Manoeuvres for the treatment of benign positional paroxysmal vertigo: a systematic review," Brazilian Journal of Otorhinolaryngology, vol. 72, no.1,pp.130–139,200

