

# EFFECTS OF EPLEY'S MANEUVER AND VESTIBULO-OCULAR REFLEX STIMULATION EXERCISES ON VERTIGO PATIENTS

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## ABSTRACT

**Objective:** To determine the effects of Epley's maneuver and Vestibulo-ocular Reflex stimulation exercises on Vertigo patients.

**Study Design:** Randomized Control Trial (RCT).

**Place and Duration of Study:** The study duration was 06 months, from August 2016 to February 2017, at Rehab & Research Centre, Pakistan Railway General Hospital Rawalpindi.

**Material and Methods:** A Randomized Control Trial was conducted on 50 Benign Paroxysmal Positional Vertigo (BPPV) patient who were recruited through purposive sampling technique. Random assignment was done through coin toss method into two groups. Vestibular exercise group VE (n=25) and Control group/Traditional Treatment TT (n=25). Baseline assessment and after 2weeks assessment was conducted. Motion Sensitivity Quotient (MSQ) scale and Dizziness Handicap Inventory (DHI) scale were used for data collection. Data was analyzed on SPSS-20 version.

**Results:** 50 patients were recruited having mean age of  $43.42 \pm 19.93$  yrs, with 94.0% patients having positive nystagmus. Prior to treatment, P-value of MSQ was 5.622 and for DHI 0.320. After 2 weeks of intervention significant improvement was recorded in MSQ and DHI with p value <0.001.

**Conclusion:** It is concluded from this study that Epley's maneuver and Vestibulo-ocular Reflex stimulation exercises reduce Nystagmus, dizziness and vertigo and improve quality of life. At least 2weeks of treatment is required for better outcome.

**Keywords:** Balance, Dizziness, Nystagmus, Quality of life, Vertigo

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## INTRODUCTION

The human vestibular system is a sensory equilibrium system that manages and controls the humane sense of balance and movement<sup>1</sup>. Peripheral vestibular organs translate the angular, translational and head tilt motions relative to the gravity. The semicircular canals and otolith organs provide continuous input to the brain about rotational and translational head movements. This information from vestibular organs like Semicircular canals and otolith including their pathways maintains the gaze and posture via Vestibulo-Ocular reflex and Vestibulo-Spinal reflex<sup>2</sup>. Signs and symptoms of the vestibular dysfunction are vertigo, nystagmus, visual inability on head movement, blurring or double vision, spinning sensations or dizziness, tinnitus, asymmetrical posturing in sitting or standing and disequilibrium<sup>3</sup>.

The membranous labyrinth of each ear consists of three semicircular canals. Anterior semicircular canal (ASC),

Posterior semicircular canal (PSC) and Horizontal semicircular canals (HSC) and they are at right angle of each other<sup>4</sup>. Fluid is filled into bony semicircular canals, loose connective tissues float with contained endolymph. Rotatory conditions are different in three canals, that is how diagnosis of involved canal is done by maintaining different head positions. Three canals are at right angle with each other, so the rotatory movement in any axis can be detected by any of the canal and then it will pass through the nerves<sup>5</sup>.

Benign paroxysmal positional vertigo is a disorder of the inner ear<sup>6</sup>. BPPV is the most common peripheral vertigo and the posterior or lateral semicircular canals are usually affected. BPPV is characterized by brief attacks of rotary vertigo associated with positional nystagmus which are elicited by specific head positions or change in head position relative to gravity. The pathophysiology of BPPV is canalolithiasis comprising of free floating otoconial debris adherent to cupula<sup>7</sup>.

Prevalence of BPPV is more common in women and elder population. There is an association between osteoporosis and BPPV. Theoretically a disturbance in calcium metabolism as occurring in osteoporosis and osteopenia increases calcium resorption which generates free calcium in endolymph and reduces its capacity to dissolve the dislodged otoconia<sup>8</sup>. BPPV is mainly of idiopathic cause, but there are many factors which contribute in the occurrence of BPPV in all kind of patients. In middle aged women hormonal factor can be the cause of BPPV,

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Decreased bone mineral density both in males and females leads to BPPV. Prevalence of BPPV is high in patients with osteopenia and osteoporosis. After menopause there are more chances to develop BPPV because of the disturbed calcium metabolism. In diabetic and Hypertensive patients BPPV is more commonly occurring problem. Gold standard test for the diagnosis of BPPV is Dix-Halpike maneuver which is performed by asking the patient to move from long sitting to supine position and turn head to 45 degree to left or right, wait for 1 minute and observe the nystagmus and vertigo<sup>9</sup>. Vestibular rehabilitation has been always a neglected part of rehabilitation; Evidence has shown that vestibular rehabilitation can be effective in improving symptoms related to many vestibular disorders. Individuals with complaints of dizziness, with comorbidities including hypertension and diabetes, may benefit from a screening and treatment for BPPV.

### MATERIAL AND METHODS

A Randomized controlled trial study was conducted at rehab & research center for 6 months in Pakistan railway general hospital. 50 patients were approached and randomly allocated through coin toss method equally in two groups. OpenEpi was used to calculate sample size. Vestibular exercise group (n=25) and traditional treatment group (n=25). Non probability sampling technique was used to collect the data.

Both genders, Adult Population (above 20yrs) and BPPV (benign paroxysmal positional vertigo) patients diagnosed by Neurologist were included. Patients with any Co-morbidity, Infection, tumor, severe hearing deficit, having any genetic disease and all vestibular disorders other than BPPV were excluded.

Data was collected using Motion sensitivity quotient, Dix-Halpike maneuver, Visual vertigo analogue scale for dizziness and Dizziness Handicap Inventory. Traditional treatment group was given traditional treatment for vertigo including Dix-Halpike maneuver for diagnosis, then medication for treatment of vertigo. VE (vestibular exercises group) was given Vestibular exercises treatment using Dix-Halpike maneuver for diagnosis, Epley's maneuver and VOR stimulation exercises. Treatment was provided for 2-3 days per week for up to 2 weeks. Duration of study was 6 months, from August 2016 to January 2017.

### TREATMENT PROTOCOLS

The assessment was conducted at baseline and after 2 weeks of intervention. Both groups were diagnosed using Dix-Halpike maneuver then were assessed for the outcome measure using both treatment techniques. In the vestibular exercise group, patients were given exercises for 2 days per week, 45 minute of session for 2 weeks (Table 1).

### RESULTS

The study results showed that total patients were 50 among them 44.0% (n=22) were male and 56.0% (n=28) were female,

Out of all participants 48.0% (n=12) males and 52.0% (n=13) females were in Structured Vestibular rehabilitation (SVR) group. Whereas Traditional Treatment (TT) containing 40.0% (n=10) males and 60.0% (n=15) females. Percentage of patients having diabetes 38.0% (n=19) and hypertension 50.0% (n=25). Nystagmus was positive in 94.0% (n=47) patients and Dix-Halpike test was positive in 100% patients both in control and experimental groups (Table 2).

Mean age of the population  $43.42 \pm 19.93$  years with SVR patients having  $43.40 \pm 20.16$  years and TT patients having age of  $43.44 \pm 20.11$  years.

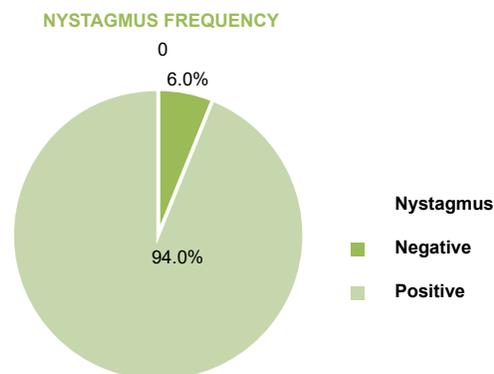


Figure 1: Nystagmus Frequency.

Nystagmus was positive in 94.0% patients and negative in 6.0% participants were not having nystagmus (Figure 1).

Data was non-skewed; Mann Whitney U test indicates that there is a no significant difference at baseline. Motion sensitivity Quotient scale for VE with Mean  $\pm$  SD  $73.35 \pm 24.95$  at baseline and after 2 weeks mean  $\pm$  SD is  $7.37 \pm 6.35$ . TT baseline Mean  $\pm$  SD was  $70.20 \pm 24.95$  and after 2 weeks mean  $\pm$  SD  $70.20 \pm 32.28$ , Z-value was 0.408 at baseline and 5.622 after 2 weeks. P-value was 5.622 at baseline and after 2 weeks P-value is 0.000 which is less than 0.05. Results indicate that there is a significance difference in both groups (Table 3).

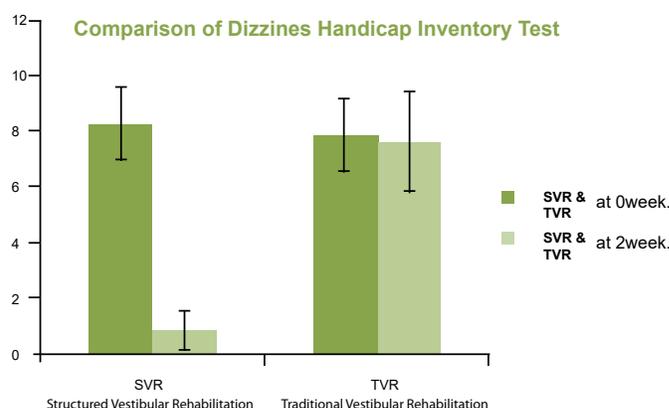


Figure 2: Comparison of Dizziness Handicap Inventory Test.

The above bar chart shows the difference in mean values of Dizziness handicap inventory test in both groups at baseline and after vestibular rehabilitation of 2 weeks (Figure 2).

**Table 1: Treatment Protocol for Both Groups.**

Days	Traditional treatment for BPPV Group (A)	Vestibular Exercises for BPPV Group (B)
1 <sup>st</sup> day	Dix-Halpike maneuver Medications	Dix-Halpike maneuver Epley’s maneuver
4 <sup>th</sup> day		VOR stimulation Exercises
7 <sup>th</sup> day	Dix-Halpike maneuver, Medications	Epley’s maneuver
10 <sup>th</sup> day		VOR stimulation Exercises
14 <sup>th</sup> Day	Re-evaluation	Re-evaluation

**Table 2: Demographics Distribution.**

Variables		F	Total %	Vestibular exercise Group(VE)	Treatment Group(TT)
Gender	Male	22	44.0%	48%(n=12)	40%(n=10)
	Female	28	56%	52%(n=13)	60%(n=15)
DM	+ive	19	38%	36%(n=9)	40%(n=10)
	-ive	31	62%	64%(n=16)	60%(n=15)
HTN	+ive	25	50%	52%(n=13)	48%(12)
	-ive	25	50%	48%(n=13)	52%(13)
Nystagmus	+ive	47	94%	96%(n=24)	92%(n=23)
	-ive	3	6%	4%(n=1)	8(n=2)
Dix-Halpike maneuver	Yes	100	100%	100%(n=50)	100%(n=50)
	No	0	0%	0.0%(n=0)	0.0%(n=0)

**Table 3: Mann-Whitney U test for Motion Sensitivity Quotient Scale.**

S\NO	Variables	Vestibular exercise Group(VE) Mean±SD	Treatment Group(TT) Mean±SD	Z Value	P value
1	MSQ at 0 week	73.35 ± 24.95	70.20 ± 24.95	0.408	5.622
2	MSQ at 2 weeks	7.37 ± 6.35	70.20 ± 32.28	5.622	0.000

## DISCUSSION

As study suggests, the vestibular rehabilitation resulted to be very effective in minimizing the symptoms of Nystagmus and vertigo in BPPV patients and improving their quality of life. Recently, vestibular rehabilitation has become a well-known treatment option for the BPPV patients. Literature has proven the vestibular rehabilitation as effective in improving the symptoms. SL Whitney conducted a study and demonstrated the effectiveness of vestibular rehabilitation in minimizing medication need and reducing the vertigo symptoms in early stage peripheral vestibular disorder disease<sup>10</sup>.

A systemic review was performed by Courtney D.Hal in 2016 in which they found the evidence that supervised vestibular rehabilitation once a week for 2-3 weeks is affective for acute and sub-acute cases of vertigo, and in chronic bilateral vestibular problems it should be one session per week for 4-5 weeks<sup>11</sup>.

A study was conducted by Wahlgren, Amy PT et all in which they provide repositioning maneuvers and education for patients with BPPV and after 3 sessions over 4 weeks of care patients demonstrated complete abolishment of their symptoms both objectively and subjectively<sup>12</sup>. Strong evidence provided by Male A et all in 2019 in which they found that 90% cases have evidence based physical rehabilitation for the management of BPPV<sup>13</sup>. In July 2009 Another study was conducted by Athanasios Katsarkas, he concluded that bilateral Benign Paroxysmal Positional Vertigo is most occurring in Post-traumatic patients and that is mainly of Posterior semi-circular canals, it can be treated with structured vestibular rehabilitation and habituation exercises<sup>14</sup>.

Hillier S1 conducted an RCT where they performed movement based rehabilitation versus physical maneuvers for BPVV. The results of their studies showed significant improvement in symptoms after physical repositioning maneuvers for short term but for long term effects combination of two is more effective than single maneuver(  $p=0.001$ )<sup>15</sup>.The results of the present study also showed significant improvement in vestibular symptoms after vestibular rehabilitation( $p<0.05$ ).

A controlled modified research "Vestibular rehabilitation of BPPV patients" was carried out by Akito Fujino. He compared the effects of Vestibular rehabilitation with medication and results statistically confirmed that there was marked improvement in symptoms of BPPV after VR in comparison with just medication. Therefore, Vestibular rehabilitation could be considered as first line management option for BPPV patients, whether it is acute or chronic condition<sup>16</sup>. An RCT on Physical therapy for the vertigo and dizziness in the primary care was conducted by L Yardley and S Beech. They compared the effects of VR and medical care in vertigo patients. Randomly, patients were assigned into treatment group and control groups, Treatment protocol was continued for 6 weeks and the treatment group presented with drastic improvement in all measurements, whereas the control group did not show any significant improvement.

The study of Vincent A van Vugt et all reported that exercises are more affective to treat BPVV as compared to drugs<sup>17</sup>.

Encapsulated study proven that Vestibular rehabilitation is very basic, less expensive and beneficial treatment method for vertigo and BPPV patient<sup>18</sup>.

Moreover, there are certain limitations of this study. As sample size of the study was not very adequate and It was not convenient to examine huge number of patients because of the limited time constraint. Extension of time for this study can lead to huge data set, therefore more accurate and reliable findings of the study can be obtained. As observed from the literature review that causes of BPPV are idiopathic, so which population can be prone to vertigo is completely idiopathic.

## CONCLUSION

It is concluded from this study that Epley's maneuver and Vestibulo-ocular Reflex stimulation exercises reduces Nystagmus, vertigo and dizziness. It helps to improve the quality of life and a better functional performance in return minimizes the fear of fall, as it is proven by improved score on Dizziness handicap inventory scale.

## AUTHORS' CONTRIBUTION

Kanwal Zafar: Principal Investigator.  
 Furqan Ahmed Saddiqui: Drafting.  
 Sana Pervaiz: Write-up.  
 Wardah Ajaz Qazi: Data Analysis.  
 Ruqiya Begum: Discussion Writing.  
 Nida: Review of the Manuscript.  
 Qurat-ul-ain: Final review of the Manuscript.

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