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## Effect of Epleys Maneuver versus Brandt-daroff Maneuver followed by gaze stability exercise on dizziness and vertigo in subjects with benign paroxysmal positional vertigo (BPPV)

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### Abstract

Background Benign paroxysmal positional vertigo is a syndrome with brief scenes of vertigo related with the frequent changes in head position. The main symptoms include vertigo, nystagmus and balance impairment among others. Drugs available till now have little or no role in the management of BPPV but clinical maneuvers are available to subside the symptoms. The most commonly used maneuvers are Epley's and Brandt-Daroff maneuvers. Gaze stability exercise is also a common and feasible exercise administered to BPPV subjects to reduce their symptoms. Objective To find out whether Epley's or Brandt-Daroff maneuver followed by gaze stability will have more effect on reducing dizziness, vertigo and improving quality of life in subjects with BPPV. Method 30 subjects diagnosed with BPPV were included in the study and divided into two groups; Group A 15 subjects who were administered Epley's Maneuver and Group B 15 subjects who were administered Brandt-Daroff Maneuver. Subjects in both groups were instructed to perform Gaze Stability Exercises for 2 weeks. Result The pre-post DHA score within each group was significantly different. However, the difference between the groups was not statistically significant. Conclusion Both treatment combinations can improve dizziness even on the follow-up of 2 weeks but the study found was no superiority of one treatment protocol over the other.

**Keywords:** BPPV, vertigo, Epley's Maneuver, Brandt-daroff Maneuver, gaze stability exercises

### Introduction

Vertigo and balance disorders are among the most well-known impairments in adults around the world <sup>[1]</sup>. For patients aged more than 65 years, dizziness and vertigo are the most common reason to consult a physician or ENT <sup>[2]</sup>. The cause of vertigo may either be central or peripheral <sup>[3]</sup>. Benign paroxysmal positional vertigo (BPPV) falls under the peripheral vertigo, this is the most widely recognized illness causing vertigo <sup>[2]</sup>. It occurs in 64 cases per 100,000 of population per each year, the lifetime pervasiveness of BPPV is 3.2% in females and 1.6% in males <sup>[4]</sup>. Benign paroxysmal positional vertigo is a syndrome with brief episodes of vertigo related with the frequent changes in head position <sup>[5]</sup>. BPPV is typically activated by explicit changes in the situation of head <sup>[6]</sup>. This can affect both quality of life and function. The beginning of vertigo attack is abrupt, and the attacks are generally accompanied by imbalance, queasiness, and nystagmus <sup>[7]</sup>. BPPV is believed to be caused by debris in the semicircular canals. Most normally, the posterior canal is affected in around 85% to 95% of cases <sup>[7]</sup>. The causes of BPPV are primary or idiopathic (50%-70%) and secondary (30%-50%) which includes closed head trauma, Meniere's disease, vestibular neuritis, migraines, inner ear surgery. The main clinical features are vertigo, nystagmus, dizziness. Other symptoms associated such as nausea, imbalance or postural stability. The diagnosis of BPPV is made in the light of the history and clinical findings, most notably a positive result in the Dix-Hallpike maneuver <sup>[8]</sup>. Treatment of BPPV is based on the affected semicircular canal. Drugs available till now have little or no role in the management of BPPV. There are numerous treatment approaches practiced to subside BPPV symptoms and number of studies has been conducted to find and compare the treatment effect of various maneuvers. The most commonly used maneuvers are Epley's and Brandt-Daroff maneuvers.

Gaze stability exercise is one of them and is actually a very common and feasible exercise administered to BPPV subjects to reduce their symptoms. GSE are found to help to improve dizziness, sensitivity to head movements, and gaze stability during head movements in patients with unilateral vestibular hypo function. The previous studies have showed that 3-5 minutes of gaze stability exercise instantly brush up the postural stability required for vestibular function [9]. In spite of having number of studies regarding BPPV treatment, the controversy regarding the most effective regime among them still persists. According to our knowledge, none of the past literatures have compared effect of gaze stability exercise when given in combination with other treatment maneuvers. This study focuses on gaze stability exercise and tries to find out the importance of gaze stability exercise in BPPV; whether Epley's or Brandt-Daroff maneuver followed by gaze stability will have more effect on reducing dizziness, vertigo and improving quality of life in subjects with BPPV.

## 2. Methodology

### 2.1. Participants

Both male and female subjects aged between 30 – 70 years were included in the study. Initially, 53 subjects were included in the sample by the method of purposive sampling. Out of 53 subjects, 30 subjects were finally recruited for the study after giving due consideration to inclusion criteria. The main inclusion criteria were Subjects with BPPV diagnosed by ENT or Neurologist and Subjects with positive findings of vertigo and nystagmus when DixHallpike maneuver was performed during examination. A positive DixHallpike maneuver was considered positive when the patient experienced nystagmus [10]. Subjects with known history of previous external or middle ear problems, cerebral vascular disease vertebro basilar insufficiency and other neurological conditions which interfere with balance were excluded from the study [6].

### 2.2. Procedure

Ethical clearance was obtained by the institution review board and Informed consent was taken from the subjects. 30 subjects suffering from BPPV were assigned into two groups by lottery method. Group A (n= 15) subjects was treated with Epley's maneuver followed by gaze stability exercise and Group B (n=15) subjects was treated with Brandt Daroff exercises followed by gaze stability exercise. Dizziness handicap inventory (DHI) was used as an outcome measure. Epley's maneuver was given only once [8]. Brand-Daroff exercise was given thrice a day for two weeks [3]. Gaze stability exercise was done for 3 minutes, thrice a day for two weeks [9]. The detailed procedure of the exercises is mentioned below. All the subjects included in group A was instructed to wear soft collars for 2-5 days post-treatment and subjects was taught to do horizontal movements of neck to prevent neck stiffness [11]. DHI scale assessment was taken pre and post-treatment after 2 weeks of intervention.

### 2.3. Diagnostic Maneuver

Dix-Hallpike maneuver:

The patient was made to sit on a couch and the patient's head was extended over the top edge of the table when supine. The head was turned 45° to the ear being tested. Then, the patient was quickly lowered into the supine position with the head extending about 30° below the horizontal. The patient's head was hold in this position and the examiner observes the patient's eyes for nystagmus. The right side being tested, the

examiner should expect to a fast-phase counter-clockwise nystagmus. The patient was then slowly brought back to the starting position and the eye was observed for reversal nystagmus and the other side was tested [8].

## 2.4. Intervention

### 2.4.1. Epley's maneuver

Modified canalith repositioning procedure is the particle repositioning maneuver (PRM) which is a 3-positions maneuver. The subject was asked to be in sitting position on a couch then rotate the head towards the involved side and extend head to 30°.

The subject was then asked to lie down on his side with the affected ear towards the ground. Next, the head was rotated 180° to the opposite side while maintaining the neck in 30° extension. The subject was rolled on to the unaffected side shoulder and slowly brought up to sitting position; the head was still maintained rotated to opposite side. The subject then was fitted with a soft collar to avoid vertical movements that may again dislodge the otoconia.

Between each step, the position was held for 1-2 minutes or until vertigo and nystagmus stops. To confirm replacement of the otoconia, the subject was instructed to remain upright position for 1-2 nights (by sleeping in a recliner chair) and avoid sleeping on the involved side for another 5 additional nights. Horizontal movements were performed to prevent stiff neck [2].

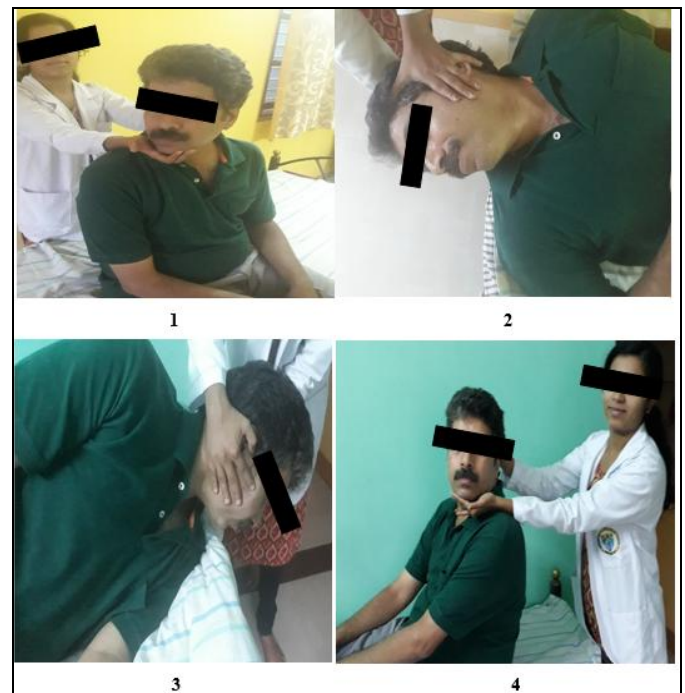


Fig 1: Epley's maneuver

### 2.4.2. Brandt- Daroff maneuver

Brandt Daroff exercise was performed in three sessions per day for two weeks. Subject while sitting upright was instructed to move into side-lying position, with the head angled upward about half way.

The side-lying position was continued for 30 seconds or until the dizziness subsides, then the patient was asked to move into sitting position. The subject was instructed to stay in sitting position for 30 seconds and then repeat the same procedure on the opposite side. These exercises were instructed to perform at home for 3 sets (morning, afternoon and evening) with 3 repetitions in each session [3].



Fig 2: Brandt- Daroff maneuver

**2.4.3. Gaze stability exercise**

The gaze-stabilization exercise (GSE) is used to stabilize the eye position to the head during postural control or locomotion. GSE improves dizziness and gaze stability during head movements in subjects with unilateral vestibular hypo

function. The effect appears to occur only at frequencies of head movement less than 5 Hz. The exercise was performed with a continuous head movement for 1 to 2 minutes and was repeated 3 times during the day <sup>[9]</sup>.



Fig 3: Gaze stability exercise

**3. Result**

Data was analyzed using SPSS (version 16) software for windows. Descriptive statistics and Chi square test were used to analyse baseline data for demographic data. Wilcoxon signed ranked test and Mann Whitney U test were used to analyse the outcome measure within and between the groups respectively. Alpha value p value was set as 0.05 (1-tailed hypothesis).

Table 1: Descriptive statistics for demographic variable

S. No:	Variable	Group A	Group B	P-value
1	Age	59.60±10.80	60.13±9.87	0.889 (>0.05)
2	Gender(M/F)	7/8	6/9	0.713 (>0.05)

Table 2: Descriptive statistics for outcome variable

S. No:	Variable	Group A	Group B	P-value
1	DHI	20.93±5.01	20.53±4.37	>0.744

Table 3: Pre – post data within Groups

Groups	Variable	Pre	Post	P-value
Group A	DHI	20.93±5.01	3.20±3.91	<0.001
Group B	DHI	20.53±4.37	4.13±3.74	<0.001

In group A, DHI pre intervention value was 20.93±5.01 and post-intervention value was 3.20±3.91. The p value was found to be <0.001 which was statistically significant. Therefore, proving that treatment given to group A brought a significant

positive change in patient’s condition. Similarly, in Group B the pre-test DHI value was 20.53±4.37 and post test value was 4.13±3.74. The difference between pre and post test values in group B was statistically significant with p-value <0.001. Therefore, treatment given to group B also brought significant improvement in patients.

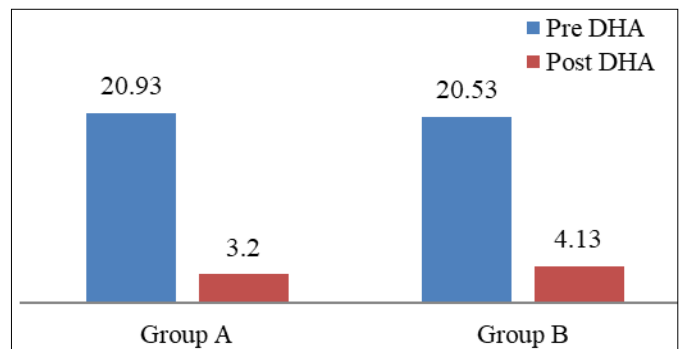
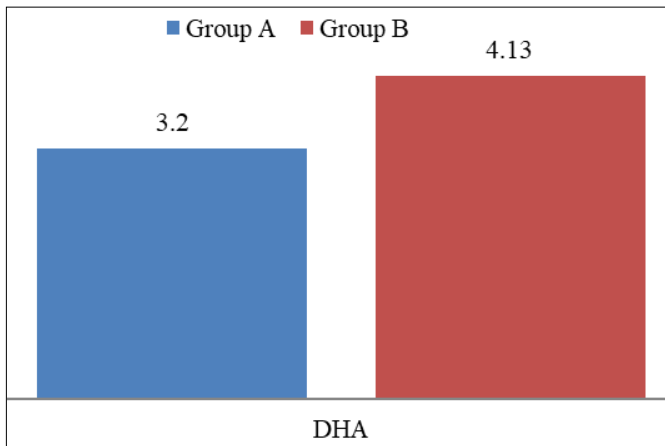


Fig 4: Pre and Post DHA score within Groups

Table 4: Post-intervention difference between group A and group B

Variable	Group A	Group B	P-value
DHI	3.20±3.91	4.13±3.74	>0.512

In group A the post DHI test value difference was 3.20±3.91 and for group B was 4.13±3.74, the difference was not statistically significant. The p value was >0.512.



**Fig 5:** Within Groups Post DHA

This result thus showed that even though the treatment given to both the groups i.e. Group A and Group B were effective in managing the condition. However, there was no superiority of one treatment protocol over the other.

#### 4. Discussion

Many studies in the past have shown significant effect of Epley's maneuver, Brandt-Daroff exercise and other vestibular exercise to reduce BPPV induced symptoms like dizziness and vertigo.

In this study, it was observed that Epley's maneuver followed by gaze stability exercise was effective in reducing symptoms in subjects with BPPV. The finding is consistent with many other studies done previously which show Epley's maneuver is effective to reduce dizziness in BPPV subjects. The Epley's maneuver tends to move the dislodged otoconia debris out of semicircular canal through rapid head positions [5, 8]. Under normal circumstances the otoconia are dislodged, absorbed and renewed constantly. The natural dissolution of otoconia occurs in utricle but if otoconia is displaced into the semicircular canal it will not dissolve in the endolymph because, the otoconia are more than twice the density of the endolymph. During Epley's maneuver the otoconia substance move out of the semicircular canal through rapid head positions and will reach into the utricle where they are automatically dissolved [12].

Brandt-Daroff followed by gaze stability was instructed to perform 3 sessions/ day in this study. The pre and post intervention DHI scale score was significantly different. Brandt-Daroff exercise, are designed to accommodate the central nervous system to change in head position and also act by dislodging debris and leading to move the debris out of semicircular. The result may vary from individual to individual depending on level of tolerance and intensity of stimulus [2].

Epley's or Brandt-Daroff maneuver combined with GSE help to improve dizziness. Gaze stability exercise is an adaptation of exercise used to stabilize the eye position to the head during postural control or locomotion. During GSE the canals and otoliths are stimulated by head movements and the vestibular nerve and nucleus are activated. Some impulses are transmitted to four rectus muscles and two oblique muscles to produce eye movements to reduce retinal slip. [13] Akiyoshi et al 2017 conducted a study to find out the effect of gaze stability exercise on vestibular function. The author concluded that 3-5 minutes of GSE immediately improve the postural stability required for vestibular function improvement [9].

A meta analysis conducted by Prim-Espada et al, 2010 to find

out the efficacy of Epley's man oeuvre in BPPV concluded that Epley's maneuver is effective in controlling BPPV. It is available in literature that subjects who undergo the Epley's Maneuver are 6.5 times more likely to get relief from their acute clinical symptoms [14]. According to Suneel Kumar *et al.* 2016, canalith repositioning maneuvers like Epley's are most effective and less time-consuming procedure in treating the BPPV subjects and also found to have lower reoccurrence percentage [2]. Inger Wegner *et al.* 2014 conducted a systemic review to evaluate the effectiveness of the Epley maneuver compared with vestibular rehabilitation on p-BPPV. It was found that there is moderate-quality evidence that the Epley maneuver is more effective in treating p-BPPV than vestibular rehabilitation with regard to patient-reported symptom relief [7]. Most studies suggest that the Epley maneuver and vestibular rehabilitation are equally effective at 1-month follow-up. The authors recommend to treat patients with the Epley maneuver & vestibular rehabilitation in patients who do not tolerate the Epley maneuver or who do not respond to treatment with the Epley maneuver.

Lisa *et al.* 2010 who conducted a study to find out the efficacy of GSE in older adults with dizziness concluded that in older adults with symptoms of dizziness and no documented vestibular deficits, the addition of vestibular specific gaze stability exercise (GSE) to balance rehabilitation results in greater reduction in fall risk [13].

GSE may be an effective exercise for modulating excitability of the vestibular reflex as it is easy to perform even by individuals with balance dysfunction due to age, stroke, tumor or disease associate with vestibular system. It is comparatively more feasible and can be performed In any place without requiring special instrument of rehabilitation [9].

#### 5. Conclusion

This study concluded that both the treatment regimes i.e. Epley's followed by gaze stability exercises and Brandt-Daroff followed by gaze stability exercises cause significant reduction in dizziness and vertigo in BPPV subjects. The study however didn't show statistically significant difference between the treatment groups. Clinically Epley's maneuver combined with GSE showed better result than its counterpart exercise regime. Hence the study concluded that both treatment combinations can improve dizziness even on the follow-up of 2 weeks. However, the study found was no superiority of one treatment protocol over the other.

#### 6. Limitations and Further Recommendations

The study didn't have a control group to compare the effectiveness of exercise regimes. Also, lack of follow-up for a longer duration is another drawback of this study. Larger size study with control group and longer follow up is recommended in future to have a more detailed and precise result.

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