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Original Article

ROLE OF MODIFIED EPLEY'S MANEUVER AND BRANDT-DAROFF EXERCISES IN TREATMENT OF POSTERIOR CANAL BPPV: A COMPARATIVE STUDY

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ABSTRACT

Background: Benign paroxysmal positional vertigo (BPPV) defined by Dix and Hallpike is one of the most common disorders causing vertigo. BPPV is more prevalent in adults and in women. BPPV mostly develops in the posterior semicircular canal. The main symptom of BPPV is vertigo induced by a change in head position with respect to gravity. The Dix-Hallpike test is the most commonly used test to confirm the diagnosis of posterior canal BPPV. Treatment options for posterior canal BPPV are Epley's maneuver, Liberatory maneuver and Brandt-Daroff exercises. In modified epley's maneuver few modifications were done in original epley's maneuver without affecting outcome.

Objective: To assess effectiveness of modified epley's maneuver as well as combination of modified epley's maneuver with Brandt-Daroff exercise in patients with posterior canal BPPV and to compare both treatment protocols.

Methodology: All patients were examined by Dix-Hallpike test (D-H Test) and those suffering from posterior canal BPPV and fulfilling inclusion criteria were taken up for the study. Total thirty five patients took part in this study on a voluntary basis after signing consent form. The patients were randomly assigned to two groups. In group 1, combination of modified epley's maneuver and Brandt-Daroff exercise were given and in group 2 only modified epley's maneuver was given. All patients were reexamined after 1 week of treatment and were asked to come for follow up after 1 month. In follow up visits response to Dix – Hallpike maneuver and Dizziness Handicap Inventory(DHI) were assessed as outcome measures.

Results: Data collected through this study showed highly significant improvement in DHI score and response to D-H test when intragroup comparison is made in both the groups after 1 week and 1 month of treatment at 1% level of significance. When intergroup comparison is made we found better improvement in group 2 after 1 week and in group 1 after 1 month of treatment.

Conclusion: The conclusion of the study is that both treatment approaches are effective in reducing symptoms and improving independence level but combined approaches can give better result.

KEY WORDS: Canalith repositioning maneuver, vertigo, nystagmus, DHI, Dix-Hallpike test.

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INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) defined by Dix and Hallpike [1], is one of the most common disorders causing vertigo [2,3] in adults and fortunately, is a very simple disorder to manage.[4,5] The cause of BPPV is mostly idiopathic. It may develop secondary to various disorders that damage the inner ear, head

trauma, infection, and aging. Idiopathic BPPV is more prevalent in adults and in women, with women to men ration of 2:1 [6,7].

Schuknecht, proposed the theory of cupulolithiasis in which degenerative debris from the utricle adhere to the cupula, making the ampulla gravity sensitive. A second theory, canalithiasis, was proposed by Hall and colleagues in which the degenerative debris is floating freely in the endolymph of the semicircular canal [5,8]. BPPV can be caused either by canalithiasis or by cupulolithiasis.

Movement of the head causes these otoliths to inappropriately trigger the receptors in the semicircular canals and send false signals to the brain, causing vertigo and nystagmus [9]. Posterior canal BPPV has been said to account for 60-90% of all BPPV cases [10,11].

The main symptom of BPPV is vertigo induced by a change in head position with respect to gravity. Patients typically develop vertigo when getting out of bed, rolling over in bed, tilting their head back, or bending forward. The symptoms of BPPV may vary among patients, and may manifest with nonspecific dizziness, postural instability, lightheadedness, and nausea [12,13]. The vertigo in BPPV is typically intermittent and positioning dependent, which usually resolves within 30 seconds in posterior canal BPPV [1].

The Dix-Hallpike test [1] is the most commonly used test to confirm the diagnosis of posterior canal BPPV. In this test, the patient's head is turned 45 degrees horizontally towards the affected side while the patient is in sitting position (fig-1). The patient then quickly lies down with the head hanging over the edge of the treatment table approximately 30 degrees below horizontal (fig-2). The examiner asks whether the patient has vertigo and observes for nystagmus. Right posterior canal involvement produces upbeating and rightward torsional nystagmus during right Dix-Hallpike test.

Treatment options for posterior canal BPPV are Epley's maneuver, Liberatory maneuver and Brandt-Daroff exercises. Epley has introduced a procedure in which the posterior canal is rotated backwards close to its planar orientation, thus directing foreign material out of the canal into the utricle [14].

There are many studies on effect of epley's maneuver for the treatment of BPPV. Little attention has been given to the comparison of modified epley's maneuver with modified epley's maneuver and Brandt Daroff exercise so the need of the study is to find out the effectiveness of each protocol and to compare both protocols.

METERIALS AND METHODS

Study has conducted at the Physiotherapy department of Pioneer Physiotherapy College, Vadodara, Gujarat, India, Study design adopted for this study was Prospective longitudinal follow up study.

Inclusion Criteria for the study is that the diagnosis of BPPV of the posterior canal was based on the presence of following characteristic of paroxysmal nystagmus on D-H test:

1. Latency vertigo and nystagmus begin one or more seconds after head is tilted towards the affected ear. 2. Observation of an up beating torsional nystagmus (fast phase of the superior pole beating towards the undermost ear) or mixed vertical- torsional nystagmus. 3. Vertigo and nystagmus lasting less than 60 seconds.

The exclusion criteria, which will be detected through the clinical history, physical examination and neuroimaging are:

1. Previous or current diagnoses of labyrinthine diseases such as Ménière's disease, labyrinthitis or vestibular neuronitis. 2. Contraindications to canalith repositioning procedures: cervical spinal stenosis, severe kyphoscoliosis, limited cervical mobility, Down syndrome, advanced rheumatoid arthritis, cervical radiculopathies, Paget's disease, morbid obesity, ankylosing spondylitis, severe lumbar dysfunction and spinal cord injuries. 3. Disorders of central nervous system 4. Patient refusal to participate in the study. 5. Other causes which may hinder the understanding of the objectives and methodology of the trial (language, low educational level, and so on).

Procedure: All patients were examined by Dix-Hallpike test (D-H Test) and those suffering from posterior canal BPPV and fulfilling inclu-

sion criteria were taken up for the study. Total thirty five patients took part in this study on a voluntary basis after signing consent form. This study was approved by the Institutional Ethical Committee of our institution. All the subjects were assessed as per the evaluation format before starting treatment. The procedure was explained to all the subjects.

The patients were randomly assigned to two groups. No subjects received medication, special instructions about sleeping position, or mastoid vibration during treatment. All patients were reexamined after 1 week of treatment and were asked to come for follow up after 1 month of treatment. In follow up visits response to Dix – Hallpike maneuver and Dizziness Handicap Inventory (DHI) were assessed as outcome measures.

In group 1, patients underwent 1 repetition of the modified Epley's maneuver in one session once a week and Brandt-Daroff exercise three times a day for one week. Then they continued Brandt-Daroff exercise two times a day for remaining 3 weeks.

Patients in group 2 underwent 3 repetitions of the modified Epley's maneuver in one session once a week and, in case of failure or incomplete remission of the symptoms, the same maneuver was repeated.

The patients were asked to keep the eyes open to watch the nystagmus. The maneuver was performed in the following steps.

During the modified Epley's maneuver [14],

· The patient first is moved from sitting into the Dix-Hallpike position toward the side of the affected ear and then remains in that position for 30 seconds. Then the head (labyrinth) is shifted to the next position (fig – 1, 2).

· The second phase of the treatment is to rotate the patient's head slowly through moderate extension of the neck toward the unaffected side so the head is below horizontal. Again, the patient stays in the new position until the nystagmus stops. If there is no nystagmus, the position is maintained for approximately 30 seconds (fig – 3).

· The patient is then rolled to a side-lying position with the head turned 45 degrees down (toward the floor) and kept in that position for 30 seconds (fig – 4).

· Finally, keeping the head deviated toward the unaffected side and pitched down, the patient slowly sits up. Some patients experience vertigo shortly after returning to the seated position (fig 5).

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Brandt – Daroff exercise is performed as follows:

· The patient first sits over the edge of the table and turns his or her head 45 degrees toward the unaffected side and then is moved rapidly into the affected side-lying and stays there for 30 seconds (fig - 6, 7).

· The patient then slowly returns to starting position maintaining head rotation until sitting upright.

· The patient remains in the upright position for

30 seconds, turns his or her head 45 degrees in the opposite direction and then moves rapidly into the mirror-image position on the other side, stays there for 30 seconds, and then sits up (fig – 8).

· The patient then repeats the entire maneuver for 10 times.

RESULTS

In this study 35 patients suffering from posterior canal BPPV were selected and randomly assigned to two groups. Then physical rehabilitation was started depending on the patients' distribution. All patients were reexamined after 1 week and 1 month of treatment. In follow up visits response to Dix – Hallpike maneuver and Dizziness Handicap Inventory were assessed as outcome measures.

Response to Dix-Hallpike maneuver became negative in 77.77% and 94.4% of patients in group 1whereas in group 2 it became negative in 82.35% and 88.23% of patients after 1 week and 1 month of treatment respectively.

Result of DHI score showed highly significant improvement in both the groups when intragroup comparison is made after 1 week and 1 month of treatment at 1% level of significance (table-1,2,3,4)

Table 1: Comparison of DHI score in patients with BPPV in group 1 (n = 18).

Pre Physical Rehabilitation Mean ± SD	Post 1 wk of Rehabilitation Mean ± SD	t value	p value	Results
53.22 ± 10.65	39.53 ± 4.93	8.56	< 0.001	Highly Significant

At 17 degrees of freedom, the observed 't' value is 8.56 which is suggestive of statistically highly significant ($p<0.001$) improvement in DHI score after 1 week of physical rehabilitation.

Table 2: Comparison of DHI score in patients with BPPV in group 1 (n = 18).

Post 1 wk of Physical Rehabilitation Mean ± SD	Post 1 month of Rehabilitation Mean ± SD	t value	p value	Results
39.56 ± 4.78	30.82 ± 2.92	12.33	< 0.001	Highly Significant

At 17 degrees of freedom, the observed 't' value is 12.33 which is suggestive of statistically highly significant ($p<0.001$) improvement in DHI score after 1 month of physical rehabilitation.

Table 3: Comparison of DHI score in patients with BPPV in group 2 (n = 17).

Pre Physical Rehabilitation Mean ± SD	Post 1 wk of Rehabilitation Mean ± SD	t value	p value	Results
58.35 ± 12.39	37.50 ± 3.69	8.16	< 0.001	Highly Significant

At 16 degrees of freedom, the observed 't' value is 8.16 which is suggestive of statistically highly significant ($p<0.001$) improvement in DHI score after 1 week of physical rehabilitation.

Table 4: Comparison of DHI score in patients with BPPV in group 2 (n = 17).

Post 1 wk of Physical Rehabilitation Mean ± SD	Post 1 month of Rehabilitation Mean ± SD	t value	p value	Results
37.53 ± 3.5	33.88 ± 3.05	7.96	< 0.001	Highly Significant

At 16 degrees of freedom, the observed 't' value is 7.96 which is suggestive of statistically highly significant ($p<0.001$) improvement in DHI score after 1 month of physical rehabilitation.

When comparison is made between the groups after 1 week of treatment, group 2 showed more improvement than group 1 at 5% level of significance(table 5) and after 1 month of treatment, group 1 showed superior result than group 2 at 1% level of significance (table 6).

Table 5: Comparison of DHI score post 1 wk of treatment in group 1 & group 2.

Post 1 wk of Rehabilitation (group-1) Mean ± SD	Post 1 wk of Rehabilitation (group-2) Mean ± SD	t value	p value	Results
13.67 ± 6.44	20.00 ± 9.80	-2.25	< 0.05	Significant

At 33 degrees of freedom, the observed 't' value is -2.25 which is suggestive of statistically significant ($p<0.05$) improvement in DHI score after 1 week of physical rehabilitation in both groups

Table 6: Comparison of DHI score post 1 month of treatment in group 1 & group 2.

Post 1 month of Rehab (group-1) Mean ± SD	Post 1 month of Rehab (group-2) Mean ± SD	t value	p value	Results
8.78 ± 2.84	3.63 ± 1.82	6.2	< 0.001	Highly Significant

At 33 degrees of freedom, the observed 't' value is 6.20 which is suggestive of statistically highly significant ($p<0.001$) improvement in DHI score after 1 month of physical rehabilitation in both groups.

DISCUSSION

In this study 13 patients were male and 22 were female so here we also found female predominance as in other studies. The ratio of female to male is 1.69 : 1 in this study. The range of age was 35–72 years while the mean age of the patients in group 1 was 51.17 ± 9.35years whereas in group 2 it was 53.18 ± 11.33 years.

Data collected through this study showed highly significant improvement in DHI score and response to D-H test when intragroup comparison is made in both the groups after 1 week and 1 month of treatment so both treatment approaches are effective.

In this study when intergroup comparison is made we found more improvement in group 2 after 1 week of treatment but it was better in group 1 after 1 month of treatment so combined approach will be more beneficial to the patients.

Many researchers suggested that Epley's maneuver (canalith repositioning maneuver) is effective in reducing vertigo and response to the Dix-Hallpike manoeuvre [15-21].

Premedication, postural restriction and use of mastoid oscillator during maneuver are part of original epley's maneuver. In this study they were not used to save the time and make the procedure easier without affecting outcome so it is considered as modified epley's maneuver. Even there are many researches supporting these modifications.

According to a recent meta-analysis of the modified Epley's maneuver for PC-BPPV, the treatment demonstrated a symptom improvement rate four times greater, and a nystagmus resolution rate five times greater than the placebo group [22].

Brandt- Daroff exercise demonstrates superior treatment outcomes compared with placebo [23]. However, many researchers found Brandt-Daroff exercises to be less effective than Epley's maneuver in producing complete symptom resolution [23,24,25,26].

Amor Dorado [27] compared Epley treatment versus Brandt-Daroff exercises and found an 80.5% resolution rate in the Epley group versus 25% resolution in the Brandt-Daroff exercises group after seven days. There was no difference in resolution after one month.

Few researchers [28,29] found that CRP plus a home program does not improve the outcome. But, in our study we found combination of modified epley's maneuver with brandt daroff exercise to be more effective in reducing symptoms and making patient independent. Tanimoto [30] et al and Chang [31] also found similar results.

Limitation of the Study: Small sample size, Limited time follow up (1 month), Quality of life was not assessed.

CONCLUSION

The conclusion of the study is that both treatment approaches are effective in reducing symptoms and improving independence level but combined approaches can give better result so modified epley's maneuver should be applied 3 times in one session along with brandt- daroff exercise as home exercise.

ABBREVIATIONS

BPPV – Benign Paroxysmal Positional Vertigo
DHI - Dizziness Handicap Inventory
D-H TEST – Dix-Hall Pike Test
CRP – Canalith Repositioning Maneuver

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