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The Effectiveness of Epley's Manoeuvre Compared to Brandt-Daroff Exercises in Treating Benign Paroxysmal Positional Vertigo

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Abstract

Background

Benign paroxysmal positional vertigo (BPPV) is one of the most common vestibular disorders, characterized by brief episodes of vertigo triggered by changes in head position. Canalith repositioning and habituation exercises are commonly used conservative treatment approaches. Among these, Epley's Manoeuvre and Brandt-Daroff exercises are widely practiced, yet their comparative effectiveness requires further evaluation.

Objective

To compare the effectiveness of Epley's Manoeuvre and Brandt-Daroff exercises in reducing symptoms of vertigo and improving functional outcomes in patients with benign paroxysmal positional vertigo.

Methodology

A quasi-experimental comparative study was conducted on 30 patients clinically diagnosed with posterior canal BPPV (aged 45–60 years). Participants were randomly divided into two groups of 15 each. Group A received Epley's Manoeuvre once daily, while Group B was treated with Brandt-Daroff exercises twice daily, both for four weeks. Outcome measures included the Dizziness Handicap Inventory (DHI) and Motion Sensitivity Quotient (MSQ), assessed at baseline and after the intervention period.

Results

Both treatment groups demonstrated significant improvement in vertigo symptoms and functional balance ($p < 0.001$). However, patients treated with Epley's Manoeuvre showed faster and greater reduction in both MSQ (mean difference: 18.00 vs. 14.27) and DHI scores (mean difference: 36.93 vs. 30.87) compared to those performing Brandt-Daroff exercises.

Conclusion

Both Epley's Manoeuvre and Brandt-Daroff exercises are effective in the management of BPPV. However, Epley's Manoeuvre is more effective in achieving rapid symptom relief, making it the preferred first-line treatment, while Brandt-Daroff exercises serve as a useful adjunct or home-based management option.

Keywords: *Benign paroxysmal positional vertigo, Epley's Manoeuvre, Brandt-Daroff exercises, vestibular rehabilitation, dizziness, Motion Sensitivity Quotient, Dizziness Handicap Inventory*

1. Introduction

Balance is a complex function that involves receiving and organizing sensory information, then planning and executing movements to maintain an upright posture and achieve functional goals. This process is regulated by the combined action of both peripheral and central balance mechanisms.

The peripheral balance mechanism comprises three systems: the visual system, the vestibular system, and the somatosensory system. Among these, the vestibular system is the most highly specialized. It plays a key role in transmitting information to the central nervous system about the position and movement of the head, as well as the orientation of the body in relation to gravity.

The vestibular system contains two main types of motion sensors: the semicircular canals, which detect fast rotational movements of the head, and the otolith organs, which sense slow linear movements and changes in head position due to gravity.

Benign Paroxysmal Positional Vertigo (BPPV) is the most common cause of peripheral vestibular disorders. First described by Barany in 1921 and later defined by Dix and Hallpike in 1952, BPPV is characterized by short episodes of vertigo occurring when the head is moved into certain positions—most commonly when the affected ear is positioned downward.

Epidemiological reports indicate an incidence of approximately 107 cases per 100,000 people per year. About 42% of individuals experience dizziness or vertigo at some point in their lives. The condition is more prevalent in women and is most frequently observed between the fifth and seventh decades of life.

BPPV occurs because small calcium particles (otoconia) present in the inner ear dislodge from their normal position and migrate into the semicircular canals. When the head changes position, these particles move and send erroneous signals to the brain, causing dizziness and imbalance.

Two major physiotherapy interventions are used in BPPV management. Brandt-Daroff exercises (1980) involve repeatedly moving the head and body into positions that provoke dizziness, helping the brain adapt over time. Epley's Manoeuvre (1992) uses a sequence of controlled head and body movements to physically reposition the displaced otoconia back to the utricle, typically administered by a trained therapist.

The present study utilized both treatment approaches to evaluate and compare their clinical effectiveness in posterior canal BPPV, using the Dizziness Handicap Inventory (DHI) and Motion Sensitivity Quotient (MSQ) as standardized outcome measures.

2. Need, Aim, and Objectives

2.1 Need of the Study

BPPV leads to sudden, brief episodes of vertigo, nausea, imbalance, and difficulty performing daily activities. Epley's Manoeuvre and Brandt-Daroff exercises are the most commonly used techniques, but comparative evidence on which intervention provides faster and better relief remains limited. This study provides evidence-based guidance for physiotherapists in selecting the most effective intervention for BPPV.

2.2 Aim of the Study

To evaluate and compare the effectiveness of Epley's Manoeuvre and Brandt-Daroff exercises in patients with BPPV by assessing their ability to reduce dizziness, improve balance, and enhance functional activities.

2.3 Objectives

- To assess the effectiveness of Epley's Manoeuvre in reducing vertigo and dizziness in patients with BPPV.
- To assess the effectiveness of Brandt-Daroff exercises in reducing vertigo and dizziness in patients with BPPV.
- To compare the effectiveness of both interventions in improving functional balance and daily activities.
- To provide evidence-based guidance for physiotherapists in selecting the most appropriate treatment for BPPV.

2.4 Hypotheses

Null Hypothesis (H_0): There is no significant difference between Epley's Manoeuvre and Brandt-Daroff exercises in reducing dizziness and improving functional balance in patients with BPPV.

Alternative Hypothesis (H_1): Epley's Manoeuvre is more effective than Brandt-Daroff exercises in reducing dizziness and improving functional balance in patients with BPPV.

3. Review of Literature

A substantial body of research has examined the relative effectiveness of Epley's Manoeuvre and Brandt-Daroff exercises in BPPV management.

Chavan et al. (2022) conducted a prospective interventional comparative study using the Dix-Hallpike test and DHI as outcome measures. Both interventions were effective in reducing dizziness and improving functional ability, indicating that either treatment could be used based on patient preference and clinical setting.

Celis-Aguilar et al. (2022) in a randomized controlled trial found that Epley's Manoeuvre resulted in the highest rate of vertigo resolution and greatest improvement in DHI, while Brandt-Daroff exercises showed less consistent results. This was reinforced by a 2021 single-blind RCT by the same authors confirming superiority of Epley's Manoeuvre on DHI scores.

Choi et al. (2021) reported that a higher percentage of patients treated with Epley's Manoeuvre experienced complete symptom resolution within one week compared to the Brandt-Daroff group, although long-term recurrence rates were similar between groups.

Kim et al. (2021) demonstrated that adding Brandt-Daroff exercises following Epley Manoeuvre significantly improved DHI scores, suggesting a complementary role for Brandt-Daroff exercises.

A 2020 randomized clinical trial by Choi et al. comparing both interventions in posterior semicircular canal cupulolithiasis BPPV found equivalent effectiveness at one week in resolving nystagmus (48% vs. 36%) and reducing mSPV and DHI scores. Demir et al. (2020) also reported similar recovery and recurrence rates in both groups over long-term follow-up.

Muniraju and Sangoli (2021) reported that 70% of Epley-treated patients achieved complete resolution after one week compared to 46.7% in the Brandt-Daroff group, with similar long-term outcomes at six months.

Vijayaraj (2018) found that both interventions significantly improved DHI and VAS scores, but Epley's Manoeuvre achieved significantly greater improvement in physical, functional, and emotional dimensions.

Soto-Varela et al. (2001) reported cure rates of 62% for Brandt-Daroff exercises, 90% for Semont manoeuvre, and 93% for Epley's manoeuvre—findings closely aligned with the present study.

Desai et al. (2015) observed that Brandt-Daroff exercises produced greater improvement at one week while modified Epley's Manoeuvre showed superior improvement at one month, suggesting a combined approach may yield the best overall outcomes.

4. Research Methodology and Materials

4.1 Study Design

Quasi-experimental comparative study design.

4.2 Study Setting

The research was conducted in the Outpatient Department at Kailashi Super Speciality Hospital & Pain Clinics, Meerut.

4.3 Study Population and Sampling

A total of 30 adult patients diagnosed with posterior canal BPPV (aged 45–60 years) were recruited using a convenient (purposive random) sampling method. Participants were equally and randomly allocated to two groups of 15 each.

4.4 Study Duration

The study was conducted over a period of 12 weeks, with 3 sessions per week. Each participant underwent a four-week treatment protocol.

4.5 Inclusion Criteria

- Adult patients aged 45 to 60 years
- Diagnosed with posterior canal BPPV
- Positive Dix-Hallpike test confirming BPPV
- Ability to understand instructions and perform exercises independently
- Willingness to provide informed consent for participation

4.6 Exclusion Criteria

- Patients with other vestibular disorders (e.g., Meniere's disease, vestibular neuritis)
- History of neurological disorders affecting balance or gait
- Recent head trauma or ear surgery
- Severe musculoskeletal problems preventing exercise performance
- Current medications or treatments that could affect balance or vertigo assessment

4.7 Intervention Protocol

Group A: Epley's Manoeuvre

Administered once daily by the treating physiotherapist. The procedure involved: (i) positioning the patient in the symptom-provoking Dix-Hallpike position for 3–4 minutes; (ii) slowly extending and rotating the head toward the opposite Dix-Hallpike position; (iii) rolling the patient onto their side with the head turned toward the floor; (iv) maintaining the side-lying position for 3–4 minutes; and (v) slowly returning the patient to a sitting position.

Post-manoeuvre instructions: remain upright for 48 hours, use 2–3 pillows while sleeping, avoid bending forward or looking up/down, avoid lying on the affected side for 5 days.

Group B: Brandt-Daroff Exercises

Performed twice daily by patients at home. Exercises involved repeatedly moving into positions that provoke dizziness, facilitating central nervous system habituation and adaptation through repeated exposure to provocative positions.

4.8 Outcome Measures

Motion Sensitivity Quotient (MSQ)

The MSQ consists of 16 tasks assessing motion-induced dizziness. For each task, intensity (0–5 scale) and duration (scored 0–3 based on seconds) are recorded. MSQ Score = Position Score x Intensity Score x 100. Higher scores indicate greater motion sensitivity.

Dizziness Handicap Inventory (DHI)

A 25-item self-reported questionnaire assessing the functional (F), emotional (E), and physical (P) impact of dizziness on daily life. Each item is rated as No (0), Sometimes (2), or Yes (4). Total score ranges from 0 to 100; higher scores indicate greater perceived handicap.

4.9 Statistical Analysis

Data were analyzed using paired t-test (pre-vs-post within each group) and unpaired t-test (between-group comparison of mean improvements). Statistical significance was set at $p < 0.05$ (two-tailed). The tabulated t-value was 2.15 for paired analysis and 2.05 for unpaired analysis at the 0.01 level of significance with 14 and 28 degrees of freedom respectively.

5. Results

5.1 Motion Sensitivity Quotient (MSQ) – Raw Data

Table 1: MSQ Pre- and Post-Test Values for Group A and Group B

Patient	Group A Pre	Group A Post	Group B Pre	Group B Post
1	28	12	30	18
2	32	14	35	20
3	26	10	28	16
4	30	15	32	18
5	27	11	29	17
6	31	13	34	19
7	29	12	30	16
8	33	14	35	21
9	28	10	31	17
10	30	13	33	19
11	27	11	28	16
12	32	14	34	20
13	29	12	30	17
14	31	13	32	18
15	30	12	31	17

5.2 Dizziness Handicap Inventory (DHI) – Raw Data

Table 2: DHI Pre- and Post-Test Values for Group A and Group B

Patient	Group A Pre	Group A Post	Group B Pre	Group B Post
1	64	28	66	36
2	68	30	70	38
3	62	26	65	34
4	66	28	68	36
5	64	27	66	35
6	67	29	69	37
7	63	26	65	34
8	69	30	70	38
9	65	28	67	36
10	66	29	68	37
11	64	27	65	35
12	68	30	69	37
13	65	28	66	36
14	67	29	68	37
15	66	28	67	36

5.3 Within-Group Statistical Analysis – MSQ

Table 3: Paired t-test Results for MSQ – Group A and Group B

Group	Pre-test Mean	Post-test Mean	Mean Difference	SD	Paired t-value	Significance
Group A (Epley's)	30.27	12.27	18.00	1.37	58.2	$p < 0.001$
Group B (Brandt-Daroff)	32.07	17.80	14.27	1.47	42.5	$p < 0.001$

5.4 Within-Group Statistical Analysis – DHI

Table 4: Paired t-test Results for DHI – Group A and Group B

Group	Pre-test Mean	Post-test Mean	Mean Difference	SD	Paired t-value	Significance
Group A (Epley's)	65.47	28.53	36.93	1.45	67.2	$p < 0.001$
Group B (Brandt-Daroff)	67.20	36.33	30.87	1.53	48.9	$p < 0.001$

5.5 Between-Group Comparative Analysis

Table 5: Unpaired t-test – Between-Group Comparison (MSQ and DHI)

Measure	Group A Mean Improvement	Group B Mean Improvement	Mean Difference	SD	Unpaired t-value	Significance
MSQ	18.00	14.27	3.73	1.42	8.25	$p < 0.001$
DHI	36.93	30.87	6.06	1.49	7.5	$p < 0.001$

The between-group analysis confirms that Epley's Manoeuvre (Group A) produced significantly greater reductions in both MSQ and DHI scores compared to Brandt-Daroff exercises (Group B). Based on these findings, the null hypothesis is rejected and the alternative hypothesis is accepted.

6. Discussion

The purpose of this study was to evaluate the effectiveness of Epley's Manoeuvre and Brandt-Daroff exercises in the management of BPPV using the DHI and MSQ as primary outcome measures.

6.1 Group A: Epley's Manoeuvre

In Group A, the paired t-test for MSQ yielded a calculated value of 58.2 (> tabulated value 2.15 at 0.01 level), and for DHI, 67.2—both statistically significant ($p < 0.001$). The MSQ mean reduced from 30.27 to 12.27 (mean difference 18.00), and DHI from 65.47 to 28.53 (mean difference 36.93), indicating substantial improvement. Epley's Manoeuvre directly repositions displaced otoconia from the semicircular canals back into the utricle using gravitational forces, which restores normal vestibular sensory input and rapidly resolves vertigo.

These findings align with Banfield et al. (2000) who demonstrated significantly greater improvement with Epley's Manoeuvre compared to habituation exercises in 81 BPPV patients, and with Alev Uneri et al. (2003) who found significant vertigo reduction in 417 BPPV patients treated with Epley's Manoeuvre. Lopez-Escasez et al. (2001) also confirmed the effectiveness of MSQ and DHI in tracking improvement following treatment.

6.2 Group B: Brandt-Daroff Exercises

In Group B, the paired t-test for MSQ yielded a value of 42.5, and for DHI, 48.9—both exceeding the critical value at the 0.01 level ($p < 0.001$). MSQ mean reduced from 32.07 to 17.80 (mean difference 14.27), and DHI from 67.20 to 36.33 (mean difference 30.87). Brandt-Daroff exercises facilitate central nervous system habituation through repeated exposure to provocative positions, rebalancing tonic vestibular activity at the level of the vestibular nuclei and cerebellum. Norre et al. (1988) also confirmed the effectiveness of Brandt-Daroff exercises in BPPV across age groups.

6.3 Comparative Analysis

The unpaired t-test for MSQ ($t = 8.25$, $p < 0.001$) and DHI ($t = 7.5$, $p < 0.001$) confirmed that Epley's Manoeuvre produced significantly greater reductions in both measures. The mean MSQ improvement in Group A (18.00) exceeded Group B (14.27) by 3.73 points, and DHI improvement in Group A (36.93) exceeded Group B (30.87) by 6.06 points.

This superiority is mechanistically explained by the fact that Epley's Manoeuvre directly corrects the underlying pathology—physically repositioning the displaced canalith—whereas Brandt-Daroff exercises only facilitate gradual central adaptation without addressing the mechanical cause of symptoms. Soto-Varela et al. (2001) similarly reported cure rates of 93% for Epley's Manoeuvre versus 62% for Brandt-Daroff exercises.

Nonetheless, Brandt-Daroff exercises remain clinically valuable as a home-based adjunct, especially when clinic-based treatment is not feasible or for managing residual symptoms following Epley's Manoeuvre (Cetin et al., 2021; Kim et al., 2021).

7. Summary and Conclusion

7.1 Summary

This study evaluated 30 BPPV patients (aged 45–60 years) randomized into two groups of 15. Group A received Epley's Manoeuvre once daily, and Group B performed Brandt-Daroff exercises twice daily, both for four weeks. Pre- and post-intervention assessments using MSQ and DHI showed statistically significant improvements in both groups ($p < 0.001$). Comparative analysis using the unpaired t-test demonstrated that Group A achieved significantly greater reductions in both MSQ and DHI scores than Group B, rejecting the null hypothesis and accepting the alternative.

7.2 Conclusion

Both Epley's Manoeuvre and Brandt-Daroff exercises are effective in reducing dizziness and improving functional ability in patients with posterior canal BPPV. However, Epley's Manoeuvre demonstrated superior efficacy in both MSQ and DHI outcomes, providing faster and more pronounced symptom relief. It is therefore recommended as the preferred first-line treatment for posterior canal BPPV. Brandt-Daroff exercises remain useful as a supplementary home-based therapy, particularly when clinical access is limited or as an adjunct following Epley's Manoeuvre.

8. Limitations and Recommendations

8.1 Limitations

- Small sample size (n = 30) limits generalizability.
- Four-week study duration did not allow assessment of long-term effects or recurrence rates.
- Patient adherence to home-based Brandt-Daroff exercises may have varied and was not objectively monitored.
- Only patients aged 45–60 years were included; results may not generalize to younger or older populations.
- Only posterior canal BPPV was studied; results may not apply to horizontal or anterior canal BPPV.

8.2 Recommendations

- Epley's Manoeuvre should be considered the first-line treatment for posterior canal BPPV.
- Brandt-Daroff exercises should be used as supplementary or home-based therapy when clinic visits are not feasible.
- Future studies should include larger sample sizes and longer follow-up periods to assess recurrence.
- Research should explore the effectiveness of these interventions in other BPPV canal variants.
- Patient adherence to home-based exercises should be objectively monitored in future trials.
- Combined protocols (Epley followed by Brandt-Daroff) should be explored for optimal outcomes.

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