

## Beyond the Maneuver: Impact of Structured Counselling on Functional Recovery in Benign Paroxysmal Positional Vertigo

\*Shashank Nema<sup>1</sup>, Ripu Daman Arora<sup>1</sup>, Himanshi Grover<sup>1</sup>

### Abstract

#### Introduction:

This study assessed the effect of supplementing Canalith Repositioning Maneuvers (CRM) with structured counselling on functional recovery in patients with Benign Paroxysmal Positional Vertigo (BPPV).

#### Materials and Methods:

In this prospective, controlled study, sixty patients with posterior or lateral canal BPPV underwent appropriate CRM. Patients were randomly allocated to receive either CRM alone or CRM combined with structured counselling. Functional recovery was assessed using the Dizziness Handicap Inventory (DHI) at baseline and one week after treatment. Handicap recovery was calculated as the change in DHI score ( $\Delta$ DHI). Multivariate linear regression analysis was performed to determine whether counselling independently predicted handicap recovery after adjusting for age, sex, canal involvement, and baseline DHI severity.

#### Results:

Both groups showed significant DHI improvement after-CRM. However, the Intervention Group demonstrated a significantly greater mean  $\Delta$ DHI ( $28.80 \pm 3.13$ ) compared to the Control Group ( $22.47 \pm 4.66$ ), with a mean difference of 6.33 point ( $p < 0.001$ ). Furthermore, fewer patients in the Intervention Group (6.7% vs. 20%) returned to the clinic prematurely with concerns about persistent symptoms. After multivariate adjustment, structured counselling remained an independent predictor of greater handicap recovery ( $\beta = 5.07$ ; 95% CI: 3.15–6.98;  $p < 0.001$ ). Baseline DHI severity was also independently associated with recovery ( $p < 0.001$ ), age, sex, and canal involvement were not significant predictors.

#### Conclusion:

Structured post-maneuver counselling independently enhances early functional recovery in patients with BPPV beyond the effect of CRM alone. Incorporating counselling into routine BPPV management may improve patient-perceived outcomes during the early recovery phase.

**Keywords:** BPPV, Counselling, DHI, Patient education, Vertigo

Received date: 02 Nov 2025

Accepted date: 10 Feb 2026

\*Please cite this article; Nema SH, Arora RD, Grover H. Beyond the Maneuver: Impact of Structured Counselling on Functional Recovery in Benign Paroxysmal Positional Vertigo. *Iran J Otorhinolaryngol.* 2026;38(2):109-115.  
Doi: 10.22038/ijorl.2026.92369.4075

<sup>1</sup>Department of ENT, Head & Neck Surgery. All India Institute of Medical Sciences Tatibandh, Raipur, Chhattisgarh India.

\*Corresponding Author:

E-mail: shashanknema08@gmail.com, shashank.nema@aiimsraipur.edu.in

 Copyright©2026 Mashhad University of Medical Sciences. This work is licensed under a Creative Commons Attribution-Noncommercial 4.0 International License <https://creativecommons.org/licenses/by-nc/4.0/deed.en>

## **Introduction**

Benign Paroxysmal Positional Vertigo (BPPV) is the most common vestibular disorder, defined as transient, severe attacks of vertigo brought on by alterations in head position with respect to gravity (1). The pathophysiology is generally held to result from the migration of otoconia into the semicircular canals, the majority of the time the posterior canal causing abnormal endolymph movement and characteristic nystagmus with provocative testing (2). The introduction of Canalith Repositioning Maneuvers (CRMs), including the Epley maneuver for posterior canal BPPV, has transformed treatment, attaining success rates routinely in excess of 80-90% by a single treatment (3). These maneuvers work to reposition the displaced otoconia to the utricle, thus ending the mechanical dysfunction.

Despite of the high effectiveness of CRMs in eliminating objective nystagmus, a significant majority of patients had a suboptimal recovery experience. Most remain suffering from non-specific symptoms such as the feeling of unsteadiness, light-headedness, and loss of balance, a condition often referred to as "residual dizziness" or "subjective BPPV," which may last from days to weeks following successful repositioning (4,5). Such a discrepancy between objective resolution and subjective perception of handicap highlights an important lacuna in the management model. The Dizziness Handicap Inventory (DHI) is a standardized questionnaire that measures the functional, emotional, and physical effects of dizziness, providing a wider picture of patient recovery(6).

The persistence of symptoms is not only a vestibular problem but is heavily loaded with psychological aspects. The acute and unpredictable onset of vertigo attacks results in extreme anxiety, phobic behavior, and fear of relapse (7). This anxiety can, in turn, lead to maladaptive coping, for example, avoidance of exercise and compulsive "symptom-checking" in exacerbating positions, which may interfere with vestibular compensation, the brain's inherent capacity to adapt to vestibular asymmetries (8). In certain situations, this vicious cycle can even make people vulnerable to developing chronic postural-perceptual dizziness (PPPD), a chronic functional vestibular disorder (9). While CRM addresses the peripheral labyrinthine problem, there is a growing need for additional strategies to manage

the central nervous system's reaction to the vestibular lesions like BPPV. Patient education and counselling have emerged as potential tools for bridging this gap. Past research has examined the effectiveness of informational pamphlets (10), but the effect of an organized, proactive counselling session provided following a successful CRM is less well researched. This type of counselling, with reassurance, expectation management, and vestibular compensation promotion, may reduce anxiety, minimize the misinterpretation of any remaining sensations, and enhance the patient's perceived improvement. This study was aimed to assess the influence of a standard post-maneuver counseling protocol on patients with BPPV's functional recovery, as quantified by the Dizziness Handicap Inventory.

## **Materials and Methods**

### **Study Design and Ethical Considerations**

A prospective, two group controlled study was conducted between January 2024 and September 2024 at Department of ENT, Head & Neck Surgery. The study protocol was approved by Institutional ethical committee. (Approval no-2620/IEC-AIIMSRPR/2022) and informed consent was obtained from all participants prior to their enrollment in the study in accordance with the Declaration of Helsinki”

### **Participants**

A total of 60 patients diagnosed with Benign Paroxysmal Positional vertigo (BPPV) were recruited from the outpatient Vestibular Lab of the Department of ENT, Head & Neck Surgery. Eligible participants were aged between 30 and 70 years and had a definitive diagnosis of the geotropic variant of posterior or lateral semicircular canal BPPV. Diagnosis was confirmed by the presence of characteristic torsional up-beating nystagmus or pure horizontal geotropic nystagmus upon provocative positional testing (Dix-Hallpike and Supine Roll Tests, respectively). Patients with apogeotropic nystagmus were excluded due to controversial opinions regarding its underlying mechanism. The exclusion criteria also encompassed a history of central nervous system disorders, other vestibular pathologies (such as Meniere's disease or vestibular neuritis), cervical spine disorders contraindicating repositioning maneuvers,

significant auditory impairment, and inability to comply with the follow-up protocol.

#### **Group Allocation**

Eligible participants were randomly allocated to one of two groups, with 30 participants in each, using a computer-generated random number sequence.

- **Group A (Control):** Received standard Canalith repositioning maneuvers (CRM) only.
- **Group B (Intervention):** Received standard CRM followed by structured post-maneuver counselling.

#### **Randomization and Blinding**

Randomization was performed out using a computer-generated random number sequence with a 1:1 allocation ratio. The randomization sequence was prepared by an independent staff member who was not involved in participant recruitment, intervention delivery, or outcome assessment. Allocation concealment was maintained through the use of sequentially numbered, opaque, sealed envelopes, that were opened only after completion of participant enrollment.

Owing to the nature of the intervention, blinding of participants and treating clinicians was not feasible. However, outcome assessment was standardized and based on the self-administered Dizziness Handicap Inventory (DHI), thereby minimizing the risk of assessor-related bias.

#### **Intervention**

##### **Baseline Assessment and Initial Treatment:**

At the initial visit, all participants completed the Dizziness Handicap Inventory (DHI) to establish a baseline measure of symptom-related functional impairment. Subsequently, based on the affected canal, participants underwent the appropriate CRM:

- **Posterior SCC BPPV:** Treated with the Epley maneuver.
- **Lateral SCC BPPV:** Treated with the Gufoni maneuver.

The maneuver was performed once. After a 30-minute observation period, a positional test was repeated to check for the presence of nystagmus. If nystagmus persisted, the respective CRM was repeated once more. No positional or neck movement restrictions were advised.

##### **Post-Maneuver Counselling (Group B only):**

Immediately following the CRM and resolution confirmation, participants in Group B received

a structured counselling session from a trained clinician. The counselling protocol was standardized and covered the following key points:

**1. Positive Reassurance:** Patients were informed that their condition was benign and had been successfully resolved. They were specifically advised to avoid repeatedly checking for symptoms while assuming the provocative position (e.g., lying down, turning in bed, every time while looking up etc.).

##### **2. Differentiation of Residual Sensations:**

Patients were counselled that a sensation of head heaviness or light-headedness could persist for 2-7 days and should not be misinterpreted as a relapse of BPPV.

**3. Concept of 'Memory Back Log':** Any brief, transient episodes of mild dizziness were explained as a benign "memory back log" or somatosensory phantom of the previous BPPV, rather than a true recurrence.

##### **4. Management of Autonomic Triggers:**

Patients were advised to manage common autonomic triggers (e.g., gastritis, constipation) as these could induce non-BPPV dizziness and lead to false perceptions of relapse.

**5. Encouraging Physical Activity:** Patients were actively encouraged to resume all normal physical activities and exercises as per their capacity to enhance overall well-being and vestibular compensation.

#### **Outcome Measures and Follow-up Dizziness Handicap Inventory (DHI)**

The Dizziness Handicap Inventory (DHI) is a widely used, validated self-report questionnaire designed to assess the perceived impact of dizziness on daily functioning. It consists of 25 items across three domains: Functional (9 items), Emotional (9 items), and Physical (7 items). Responses are scored as "Yes" (4 points), "Sometimes" (2 points), or "No" (0 points), yielding a total score ranging from 0 to 100, with higher scores indicating greater perceived handicap. The DHI has demonstrated excellent validity and reliability across diverse populations. The Persian version of the DHI has been formally validated and shown to have strong internal consistency and test-retest reliability, supporting its use in Iranian clinical and research settings (11). Additionally, DHI-based constructs have been used to evaluate the psychosocial and family-perceived impacts of vertigo and imbalance (12).

### Outcome Measures

The primary outcome measure was the change in DHI score. All participants were scheduled for a follow-up visit one week ( $\pm 1$  day) after their initial treatment. At this visit, the DHI was re-administered.

Recovery was quantified by calculating the absolute difference between the pre-maneuver (baseline) and the one-week post-maneuver DHI scores ( $\Delta\text{DHI} = \text{DHI}_{\text{pre}} - \text{DHI}_{\text{post}}$ ). Here  $\Delta\text{DHI}$  is termed "Handicap Recovery".

### Results

A total of 60 patients with BPPV were enrolled and randomly allocated into two groups: the control group (Group A,  $n=30$ ), which received only the standard Canalith Repositioning Maneuver (CRM), and the intervention group (Group B,  $n=30$ ), which

received the standard CRM followed by structured post-maneuver counselling. All participants completed the study protocol and were included in the final analysis. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 28.

### Normality of Data and Descriptive Statistics

The normality of the data for all Dizziness Handicap Inventory (DHI) scores was assessed using the Shapiro-Wilk test. The results indicated that the data for Pre-maneuver, Post maneuver DHI, "Handicap Recovery" ( $\Delta\text{DHI}$ ), were normally distributed in both Group A ( $p = 0.473$ ) and Group B ( $p = 0.081$ ), fulfilling the usage of parametric tests. Descriptive statistics for the key DHI scores are presented in Table 1. The mean pre-maneuver DHI score was 37.20 ( $\pm 5.62$ ), indicating a moderate level of perceived handicap at baseline.

**Table 1.** Descriptive Statistics for DHI Scores.

Variable	N	Mean	Std. Deviation
Pre-maneuver DHI	30	37.20	5.623
Post-maneuver DHI	30	14.73	3.657
Handicap Recovery ( $\Delta\text{DHI}$ ) - Group A	30	22.47	4.659
Handicap Recovery ( $\Delta\text{DHI}$ ) - Group B	30	28.80	3.134

### Efficacy of the Canalith Repositioning Maneuver

A paired-samples t-test was conducted to evaluate the efficacy of the CRM within each group by comparing pre- and post-maneuver DHI scores. A significant reduction in DHI scores was observed in both the control group (Mean Difference = 22.47, 95% CI [20.73, 24.21],  $t(29) = 26.41$ ,  $p < 0.001$ ) and the counselled group (Mean Difference = 28.80, 95% CI [27.63, 29.97],  $t(29) = 50.34$ ,  $p < 0.001$ ). This confirms that the CRM treated BPPV effectively for both groups of patients.

### Effect of Post-Maneuver Counselling on Handicap Recovery

The primary outcome of the study was to observe the effect of counselling in "Handicap Recovery" ( $\Delta\text{DHI}$ ). An independent samples t-test was used to compare the mean  $\Delta\text{DHI}$  between the Control (Group A) and Counsellor (Group B) groups. Levene's test for equality of variances was not significant ( $F = 2.771$ ,  $p = 0.101$ ), confirming the assumption of

homogeneity of variances. The analysis revealed a statistically significant difference in the mean Handicap Recovery between the two groups ( $t(58) = -6.178$ ,  $p < 0.001$ ). The Counsellor group (Mean  $\Delta\text{DHI} = 28.80$ ,  $SD = 3.13$ ) demonstrated a significantly greater improvement in DHI scores compared to the Control group (Mean  $\Delta\text{DHI} = 22.47$ ,  $SD = 4.66$ ). The mean difference in recovery was 6.33 points (95% CI [-8.39, -4.28]) in favor of the counselling group.

### Multivariate Analysis

In the multivariate linear regression analysis adjusted for age, sex, canal involvement, and baseline DHI severity, structured counselling remained an independent predictor of greater handicap recovery ( $\beta = 5.07$ ; 95% CI: 3.15–6.98;  $p < 0.001$ ). Baseline DHI score was also independently associated with recovery ( $\beta = 0.49$ ;  $p < 0.001$ ).

Age, sex, and canal type were not significant predictors. The overall model explained 78.0% of the variance in handicap recovery (adjusted  $R^2 = 0.747$ ) (Table 2).

**Table 2.** Multivariate linear regression analysis with handicap recovery ( $\Delta$ DHI) as the dependent variable.

Predictor	$\beta$ Coefficient	Standard Error	95% Confidence Interval	p value
Counselling (Yes vs No)	5.07	0.94	3.15 to 6.98	< 0.001
Baseline DHI score	0.49	0.07	0.36 to 0.63	< 0.001
Age (years)	0.04	0.03	-0.01 to 0.10	0.135
Sex (Male vs Female)	-0.73	0.63	-2.02 to 0.56	0.260
Canal involved (Posterior vs Lateral)	-0.05	0.77	-1.61 to 1.51	0.945
Constant	3.45	2.62	-1.87 to 8.77	0.196

Group was coded as 0 = canalith repositioning maneuver (CRM) only and 1 = CRM plus structured counselling. Sex was coded as 0 = female and 1 = male. Canal type was coded as 0 = lateral semicircular canal and 1 = posterior semicircular canal.  $\Delta$ DHI represents the difference between pre-maneuver and post-maneuver DHI scores.

**Early Self-Reporting of Symptoms**

A notable difference was observed in the number of patients who self-reported back to the clinic before the scheduled one-week follow-up due to concerns about persistent or residual symptoms. In the Control group (Group A), 6 out of 30 patients (20%) reported back with complaints of persisting vertigo. In contrast, only 2 out of 30 patients (6.7%) in the Intervention group (Group B) reported back before one week, and their complaints were characterized as residual dizziness rather than true vertigo as no decisive nystagmus was seen during the testing.

**Discussion**

This study demonstrated that structured post-maneuver counselling significantly improves early functional recovery in patients with benign paroxysmal positional vertigo (BPPV). While both study groups showed substantial improvement following canalith repositioning maneuvers, multivariate linear regression analysis confirmed that the benefit of counselling persisted after adjustment for baseline DHI severity, age, sex, and canal involvement. This finding indicates that the observed improvement cannot be attributed solely to differences in initial symptom burden or demographic characteristics.

The mean Handicap Recovery ( $\Delta$ DHI) was substantially higher in the intervention group (28.80) compared to the control group (22.47), with a mean difference of 6.33 points ( $p < 0.001$ ). While a  $\Delta$ DHI of “18” is often

considered clinically significant (6), our findings indicate that the addition of counselling can push the recovery significantly beyond this threshold. This suggests that the "success" of BPPV management should not be measured by the mere resolution of nystagmus but also by addressing the patient's psychological and perceptual adaptation post-CRM. This is further established by the finding on early self-reporting: 20% of patients in the control group returned prematurely with complaints of "persisting vertigo," compared to only 6.7% in the counselled group, who reported milder "residual dizziness" without objective signs of nystagmus. This stark contrast underscores how counselling manages patient expectations and mitigates the anxiety-driven misinterpretation of normal recovery sensations. Importantly, the magnitude of benefit associated with counselling remained statistically significant after multivariate adjustment, reinforcing that counselling exerted an independent effect on functional recovery.

The baseline DHI severity was identified as an independent predictor of handicap recovery, consistent with previous observations that patients with greater perceived handicap have greater scope for improvement. In contrast, age, sex, and canal involvement were not significantly associated with recovery, suggesting that the beneficial effects of counselling are broadly applicable across patient subgroups. These findings support the concept that functional recovery in BPPV is influenced not only by mechanical resolution of otoconial displacement but also by cognitive and behavioral factors.

**Rationale for Structured Counselling Components**

The superior outcomes in the intervention group can be attributed to the multi-faceted approach of the counselling protocol, with each

component designed to target a specific post-BPPV challenge.

### 1. **Positive Reassurance and Avoidance of Symptom Checking:**

A successful CRM can create a psychological vacuum where fear of recurrence dominates (13). Clearly advising patients to avoid repeatedly checking for symptoms in provocative positions is important. This "checking behavior" can generate anxiety and potentially re-trigger benign, non-positioning-type of dizziness, leading patients to believe that the maneuver has failed. Our approach aligns with cognitive-behavioral principles that break the vicious cycle of fear and avoidance (14).

### 2. **Differentiation of Residual Sensations:**

The persistence of non-specific dizziness, imbalance, or head heaviness for days to weeks after canalith repositioning is a well-documented phenomenon, often termed "subjective BPPV" or residual dizziness (4). By pre-emptively informing patients that these sensations are a normal part of the vestibular system's recovery and not a sign of relapse, we prevent catastrophic misinterpretations. This directly addresses the leading cause of early patient concern, as seen in our control group.

### 3. **Concept of 'Memory Back Log':**

Introducing the concept of a benign "memory back log" or a "somatosensory phantom" provides a tangible, non-threatening explanation for transient dizzy spells. This neurophysiological analogy helps patients cognitively reframe fleeting symptoms, reducing their distress and the urge to seek urgent care. This concept, while not universally termed as such in literature, is consistent with models of persistent postural-perceptual dizziness (PPPD) where a transient vestibular insult can lead to long-term functional dizziness (9).

**4. Management of Autonomic Triggers:** The link between autonomic nervous system dysregulation (e.g., via stress, gastritis, constipation) and dizziness is well-established (15). By advising patients to manage these triggers, the counselling extends beyond the BPPV itself to address common co-morbidities that can manifest as dizziness, thereby preventing false alarms of recurrence and promoting overall well-being.

**5. Encouraging Physical Activity:** Vestibular compensation i.e. the brain's ability to adapt to vestibular asymmetries is activity-dependent(8).

Actively encouraging patients to resume normal activities facilitates this neural plasticity, promotes confidence, and prevents the development of maladaptive avoidance behaviors that can lead to chronic disability. Furthermore, physical exercise/activity is known to stimulate the release of neurotransmitters such as dopamine and endorphins (16). This neurochemical response can directly elevate mood, install a feeling of well-being, and counteract the anxiety and frustration often associated with vestibular disorders, thereby creating a positive feedback loop that motivates engagement in beneficial activities and supports overall recovery.

### **Comparison with Existing Literature**

Our findings on the efficacy of CRM alone are consistent with a vast body of literature [8, 9]. The novel contribution of this study is the quantification of counselling's additive benefit.

Similar to our results, a study by Bhattacharyya et al.(10) found that providing an explanatory leaflet about BPPV and its recovery process significantly reduced anxiety and improved subjective outcomes. However, their intervention was passive (a leaflet), whereas our active, verbal counselling delivered by a clinician likely carries greater persuasive and reassuring power. Another study by Ganança et al.(17) emphasized the role of vestibular rehabilitation and counselling in reducing residual symptoms, supporting our focus on education and activity encouragement.

Conversely, some studies have found limited added value in extensive counselling. A trial by Helminski et al.(18) focused on post-maneuver restrictions and found no significant benefit, which contrasts with our active encouragement of movement. This discrepancy highlights that the content of counselling is critical. Counselling that focuses on restriction and fear may be less effective than counselling, like ours, that focuses on reassurance, explanation, and empowerment.

### **Limitations**

This study has several limitations. The follow-up period was limited to one week and reflects early functional recovery only, precluding assessment of long-term stability or recurrence. The relatively small sample size and single-center design may limit the generalizability of the result. Blinding of participants and clinicians was not feasible, and outcomes were

based on a self-reported questionnaire, which may be influenced by expectation bias. Objective vestibular outcome measures were not included. Although multivariate analysis adjusted for key demographic and clinical variables, unmeasured psychosocial factors such as baseline anxiety or depression may have influenced recovery.

### Conclusion

Structured post-maneuver counselling is an effective adjunct to canalith repositioning maneuvers in the management of benign paroxysmal positional vertigo. After adjusting for baseline symptom severity and relevant demographic and clinical factors, counselling independently improved early functional recovery as measured by the Dizziness Handicap Inventory. Incorporating counselling into routine BPPV care may enhance patient-perceived outcomes during the early recovery phase.

### References

1. Von Brevern M, Radtke A, Lezius F, Feldmann M, Ziese T, Lempert T, et al. Epidemiology of benign paroxysmal positional vertigo: a population-based study. *Journal of Neurology, Neurosurgery & Psychiatry*. 2006 Dec 18;78(7):710–5.
2. Parnes LS, McClure JA. Free-floating endolymph particles: a new operative finding during posterior semicircular canal occlusion. *Laryngoscope*. 1992 Sept;102(9):988–92.
3. Hilton MP, Pinder DK. The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo. *Cochrane ENT Group, editor. Cochrane Database of Systematic Reviews [Internet]*. 2014 Dec 8 [cited 2025 Oct 10];2014(12). Available from: <http://doi.wiley.com/10.1002/14651858.CD003162.pub3>
4. Seok JI, Lee HM, Yoo JH, Lee DK. Residual dizziness after successful repositioning treatment in patients with benign paroxysmal positional vertigo. *J Clin Neurol*. 2008 Sept;4(3):107–10.
5. Teggi R, Quagliari S, Gatti O, Benazzo M, Bussi M. Residual dizziness after successful repositioning maneuvers for idiopathic benign paroxysmal positional vertigo. *ORL J Otorhinolaryngol Relat Spec*. 2013;75(2):74–81.
6. Jacobson GP, Newman CW. The development of the Dizziness Handicap Inventory. *Arch Otolaryngol Head Neck Surg*. 1990 Apr; 116(4): 424–7.
7. Mann Ben Yehuda L, Rachima D, Katz-Leurer M. Anxiety characteristics in benign paroxysmal positional vertigo: first vs. recurrent episodes. *Eur Arch Otorhinolaryngol*. 2024 June 1;281(6):3245–51.
8. Han BI, Song HS, Kim JS. Vestibular rehabilitation therapy: review of indications, mechanisms, and key exercises. *J Clin Neurol*. 2011 Dec;7(4):184–96.
9. Staab JP, Eckhardt-Henn A, Horii A, Jacob R, Strupp M, Brandt T, et al. Diagnostic criteria for persistent postural-perceptual dizziness (PPPD): Consensus document of the committee for the Classification of Vestibular Disorders of the Bárány Society. *J Vestib Res*. 2017;27(4):191–208.
10. Bhattacharyya N, Gubbels SP, Schwartz SR, Edlow JA, El-Kashlan H, Fife T, et al. Clinical Practice Guideline: Benign Paroxysmal Positional Vertigo (Update). *Otolaryngol Head Neck Surg*. 2017 Mar;156(3\_suppl):S1–47.
11. Jafarzadeh S, Bahrami E, Pourbakht A, Jalaie S, Daneshi A. Validity and reliability of the Persian version of the dizziness handicap inventory. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*. 2014; 19(8):769.
12. Jafarzadeh S, Maharati F, Jamali J. The perception of family members regarding patient's vertigo and imbalance. *Acta Otorrinolaringologica (English Edition)*. 2022;73(2):89–95.
13. Wei W, Sayyid ZN, Ma X, Wang T, Dong Y. Presence of anxiety and depression symptoms affects the first time treatment efficacy and recurrence of benign paroxysmal positional vertigo. *Frontiers in neurology*. 2018;9:178.
14. Edelman S, Mahoney AE, Cremer PD. Cognitive behavior therapy for chronic subjective dizziness: a randomized, controlled trial. *American journal of otolaryngology*. 2012;33(4):395–401.
15. Mamoru Suzuki KY. Clinical Features of Paroxysmal Positional Vertigo Presenting Combined Lesions. *Acta Oto-Laryngologica [Internet]*. 1999 Jan 1 [cited 2025 Oct 12]; Available from: <https://www.tandfonline.com/doi/abs/10.1080/00016489950181477>
16. Meeusen R, De Meirleir K. Exercise and Brain Neurotransmission: *Sports Medicine*. 1995 Sept; 20(3):160–88.
17. Ganança FF, Gazzola JM, Ganança CF, Caovilla HH, Ganança MM, Cruz OLM. Elderly falls associated with benign paroxysmal positional vertigo. *Brazilian journal of otorhinolaryngology*. 2010;76(1):113–20.
18. Helminski JO, Janssen I, Kotaspuikis D, Kovacs K, Sheldon P, McQueen K, et al. Strategies to prevent recurrence of benign paroxysmal positional vertigo. *Archives of Otolaryngology–Head & Neck Surgery*. 2005;131(4):344–8.