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Original Research Article

Enhanced efficacy of Gans repositioning maneuver followed by Cawthorne-Cooksey exercises in posterior canal benign paroxysmal positional vertigo

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ABSTRACT

Background: Posterior canal benign paroxysmal positional vertigo is the most prevalent peripheral vestibular disorder. Despite effective repositioning, many patients continue to experience dizziness and reduced balance confidence.

Methods: This single-blinded, randomized controlled trial included 64 participants with posterior canal BPPV, randomly assigned to two groups on a scheduled day with the help of a computer-generated randomization. The experimental group received the Gans repositioning maneuver followed by Cawthorne-Cooksey exercises, while the control group performed Cawthorne-Cooksey exercises alone. Outcomes were assessed using the Dizziness Handicap Inventory and the Activities-specific Balance Confidence scale after one month. Analysis of covariance was conducted, with statistical significance set at $p<0.05$.

Results: Both groups demonstrated significant improvement ($p<0.001$). The experimental group exhibited a greater reduction in DHI scores (−76.1±7.5 vs. −55.3±10.3) and a larger increase in ABC scores (45.44±4.99 vs. 13.30±3.59).

Conclusions: The combination of the Gans repositioning maneuver and Cawthorne–Cooksey exercises is significantly more effective than exercises alone in improving dizziness and balance confidence in individuals with posterior canal BPPV. Also, this approach can be used for those who have limited cervical mobility where other maneuvers are contraindicated. The combined approach addresses both the mechanical and functional aspects of the condition and should be incorporated into routine physiotherapy practice.

Keywords: Positional vertigo, Gans maneuver, Vestibular rehabilitation, Dizziness, Balance confidence

INTRODUCTION

Balance and posture are essential for independent living and rely on the integrated function of the vestibular, visual, and somatosensory systems.[1] The vestibular system, located in the inner ear, continuously provides information regarding head position, movement, and orientation relative to gravity, thereby maintaining balance and stabilizing eye movements.[2] Disruption of this system can result in dizziness, vertigo, or loss of balance, significantly impairing daily functioning.[3]

Vertigo is characterized by the sensation of movement, typically spinning, of oneself or the environment, and is frequently associated with vestibular dysfunction.[4] Benign paroxysmal positional vertigo (BPPV) is the most prevalent vestibular disorder, accounting for a substantial proportion of vertigo cases globally.[5] BPPV manifests as

brief episodes of vertigo triggered by positional changes such as lying down, turning in bed, or looking upward.[6] The posterior semicircular canal is most commonly affected, representing approximately 80–90% of cases due to its anatomical orientation.[7,8]

BPPV primarily results from canalithiasis, a condition in which otoconia migrate into the semicircular canals and disrupt endolymphatic flow, causing inappropriate stimulation of hair cells.[9] This leads to vertigo and positional nystagmus. Although repositioning maneuvers address the mechanical etiology, many patients continue to experience dizziness, unsteadiness, and reduced confidence in daily activities.[10] Vestibular rehabilitation therapy consists of specialized exercises aimed at enhancing inner ear function and promoting central adaptation through habituation, adaptation, and sensory substitution strategies.[11] Cawthorne–Cooksey exercises are widely utilized in clinical practice to improve ocular control, balance, and movement through progressive motion tasks.[12,13] The Gans repositioning technique is effective, safe, and particularly suitable for individuals with cervical spine limitations.

It is developed as a hybrid approach combining elements of the traditional Epley and Semont maneuvers. Recent evidence indicates that combining repositioning maneuvers with vestibular rehabilitation components leads to superior outcomes by addressing both peripheral and central components of BPPV.[14] The persistence of residual symptoms following repositioning maneuvers alone has been widely documented, emphasizing the need to address central vestibular compensation. However, limited research has evaluated the efficacy of the Gans maneuver in conjunction with structured exercises. The present study aims to evaluate the effects of Cawthorne-Cooksey exercises on postural balance and residual dizziness following a repositioning maneuver. It also seeks to compare the outcomes of patients receiving Cawthorne-Cooksey exercises alone with those receiving Gans repositioning followed by Cawthorne-Cooksey exercises. Furthermore, the study aims to determine whether combining repositioning maneuvers with vestibular rehabilitation can shorten recovery time, reduce residual dizziness, improve postural stability, and enhance functional mobility. The findings may help identify a more effective treatment approach for improving balance and promoting faster recovery in patients with vestibular disorders.

METHODS

Study design

This study was conducted as a prospective, single-blinded, randomized controlled trial at the Department of ENT, Malla Reddy Health City, from August 2025 to May 2026. Ethical clearance was obtained from the Institutional Ethics Committee, and the trial was registered. A total of 64 participants were recruited using computer-generated randomization on a scheduled day and completed the study. Written informed consent was obtained from all participants before enrollment.

Subjects

A total of 72 participants were assessed for eligibility; 66 met the inclusion criteria and were randomized into two groups (33 per group). During the study, one participant from each group was lost to follow-up, leaving 64 participants (32 per group) who completed the trial and were included in the final analysis. The flow of participants through each stage of the study is illustrated in the CONSORT diagram (Figure 1).

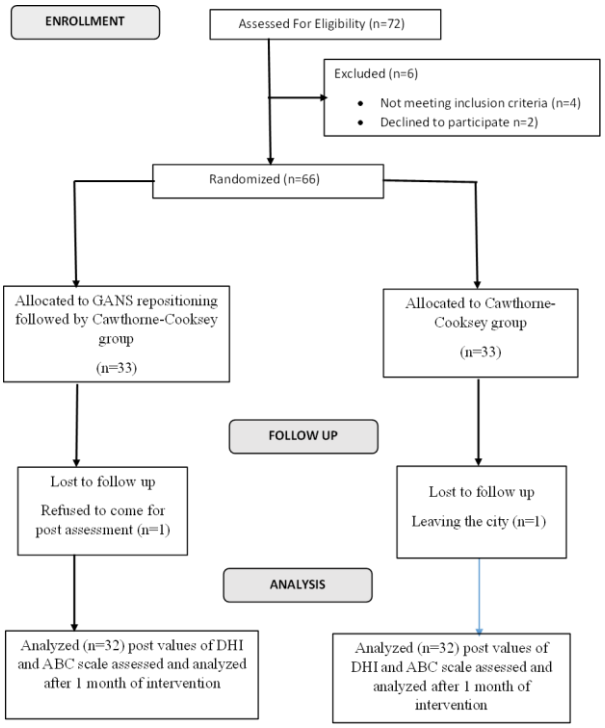

Figure 1: CONSORT diagram.

Following ethical approval from the Institutional Ethics Committee, participants were recruited from the Department of ENT, Malla Reddy Health City. Participants aged 18 years and above with an ABC score below 50% and no recent vestibular rehabilitation were included in the study. Individuals with neurological disorders, severe cardiovascular conditions, vestibular hypofunction, cervical spine limitations, vertebrobasilar insufficiency, recent head trauma or ear surgery, and other non-BPPV-related balance disorders were excluded. Patients with anterior or lateral canal BPPV and those taking vestibular suppressants were also not considered. After baseline assessment, participants were randomly allocated to two groups using a computer-generated randomization method, with allocation concealment ensured by sealed, opaque envelopes. The study used a single-blinded design in which the outcome assessors were unaware of group allocation, whereas participants

and therapists were not blinded due to the nature of the interventions. During intervention, subjects were monitored for adverse symptoms, and rest periods were provided as required.

Procedure

The experimental group received the Gans repositioning maneuver followed by Cawthorne–Cooksey exercises. The maneuver involved positioning the patient in a sitting position, turning the head 45° toward the unaffected side, quickly moving the patient onto the affected side, maintaining the position until symptoms subsided, then performing a 180° roll to the opposite side, transitioning to prone with gentle head movements and returning to sitting.[2] Both groups performed Cawthorne-Cooksey exercises, including progressive eye, head, and body movements, progressing to functional tasks such as sit-to-stand, walking, and balance activities.12The control group performed these exercises in the department under the therapist's guidance. The intervention was administered for 4 weeks, with 3 sessions per week, each lasting 30 minutes. Follow-up was done after 1 month of intervention. Outcome measures included the Dizziness Handicap Inventory (DHI) and Activities-specific Balance Confidence (ABC) scale, which were assessed at baseline and post-intervention, which is after one month. The Dix-Hallpike test was also confirmed negative at one month.

Data analysis

Statistical analysis was performed using SPSS version 31. Descriptive statistics were used to summarize demographic characteristics and baseline values. Within-group and between-group comparisons for DHI and ABC scores were performed. Analysis of covariance (ANCOVA) was applied to compare post-intervention outcomes while adjusting for baseline values. Statistical significance was set at $p<0.05$.

RESULTS

The baseline demographic characteristics of participants in both groups are presented in Table 1. There were no statistically significant differences between the groups at baseline, indicating that the groups were comparable prior to intervention. Within-group analysis demonstrated significant improvements in both groups following the intervention. Changes in DHI and ABC scores from baseline to post-intervention for each group are summarized in Table 2. Both groups demonstrated significant improvements in dizziness and balance confidence following treatment ($p<0.001$); however, the experimental group exhibited greater gains than the control group. Between-group analysis revealed significantly greater improvements in the experimental group compared to the control group. The adjusted post-intervention outcomes are presented in Table 3. The experimental group experienced a larger reduction in DHI scores (−76.1±7.5) compared to the control group (−55.3±10.3), with an adjusted mean difference of −28.68 (95% CI: −31.60 to −25.76; $p<0.001$). Similarly, ABC scores increased more in the experimental group (+45.44±4.99) than in the control group (+13.30±3.59), with an adjusted mean difference of 29.82 (95% CI: 28.74 to 30.91; $p<0.001$). These findings indicate that the combined intervention was substantially more effective.

Table 1: Demographic characteristics of participants.

Variables	Experimental group (n=32)	Control group (n=32)
Age (years, Mean±SD)	43.2±12.0	37.9±11.0
Gender, N (%)		
Male	18 (56.2%)	20 (62.5%)
Female	14 (43.8%)	12 (37.5%)
Affected side, N (%)		
Right	19 (59.4%)	21 (65.6%)
Left	13 (40.6%)	11 (34.4%)

*SD: Standard deviation

Table 2: Within-group comparison of DHI and ABC scores before and after intervention.

Outcome measure	Group	Baseline (Mean±SD)	Post-intervention (Mean±SD)	P value
DHI score	Experimental	86.2±5.5	10.1±3.3	<0.001
	Control	93.4±8.6	38.1±5.0	<0.001
ABC score	Experimental	36.82±4.66	82.26±2.45	<0.001
	Control	39.65±4.74	52.95±1.98	<0.001

*DHI: Dizziness Handicap Inventory; *ABC: Activities-specific Balance Confidence; *SD: Standard deviation

Table 3: Between-group comparison of post-intervention outcomes using ANCOVA.

Outcome value	Experimental	Control	Adjusted mean difference	P value
Measure	**(Mean±SD)**	**(Mean±SD)**	**(95% CI)**	
DHI score	10.1±3.3	38.1±5.0	−28.68 (−31.60 to −25.76)	<0.001
ABC score	82.26±2.45	52.95±1.98	29.82 (28.74 to 30.91)	<0.001

*DHI: Dizziness Handicap Inventory; *ABC: Activities-specific Balance Confidence; *SD: Standard deviation; *CI: Confidence interval

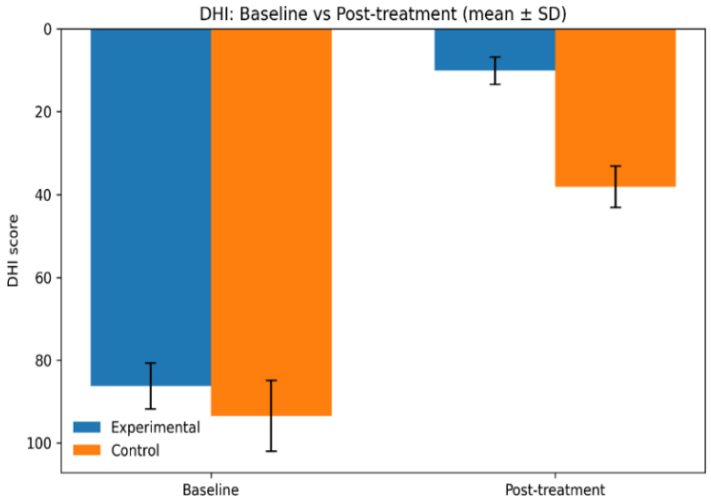

Figure 2: Comparison of pre and post-intervention DHI scores between experimental and control groups.

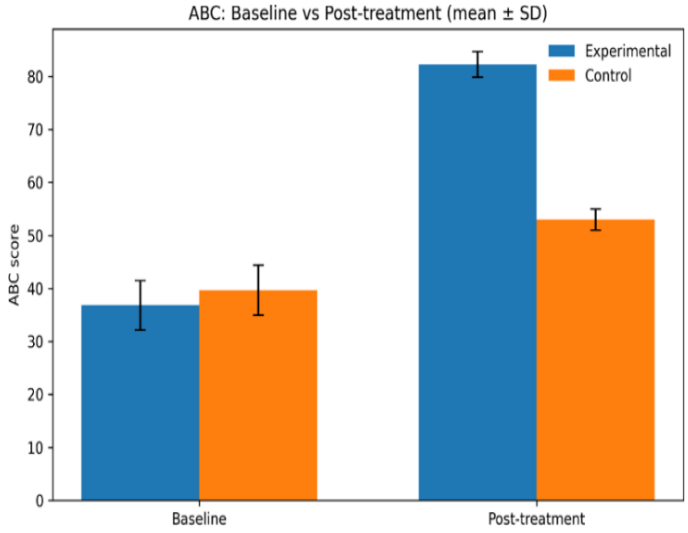

Figure 3: Comparison of pre and post-intervention Activities-specific balance confidence scores between the experimental and control groups.

DISCUSSION

The present study demonstrated that the combination of the Gans repositioning maneuver and Cawthorne–Cooksey exercises resulted in significantly greater improvements in dizziness and balance confidence compared to exercises alone. While both groups showed improvement, the experimental group achieved superior outcomes, which supports the earlier studies stating that the addition of vestibular rehabilitation can improve the outcomes. This combined approach addresses both the mechanical displacement of otoconia and facilitates central adaptation, thereby reducing residual symptoms and enhancing confidence in daily activities. These findings are consistent with those of Ravi K. et al who reported that combining repositioning maneuvers with habituation exercises improves functional outcomes and reduces residual dizziness.[14] The persistence of residual symptoms following repositioning maneuvers alone has been widely documented, emphasizing the need to address central vestibular compensation.[10] The increase in ABC scores indicates enhanced balance confidence and

reduced fear of movement among participants. Balance confidence is critical for daily functioning, and higher scores reflect successful recovery. These results are consistent with Powell and Myers, who validated the ABC scale as an effective measure of balance confidence subjectively and with Wang et al who demonstrated its applicability in individuals with vestibular disorders.[15,16]

The effectiveness of the Gans repositioning maneuver observed in this study is supported by evidence indicating that it is as effective as, or superior to, traditional techniques such as the Epley maneuver because it is a hybrid form of the Epley and Semont maneuver.[5,17] The Gans maneuver is specifically designed to minimize cervical strain while repositioning otoconia, making it suitable for a broader patient population, including older adults.[18] By addressing the mechanical etiology of BPPV, the maneuver provides rapid symptom relief. Cawthorne–Cooksey exercises are essential for promoting central compensation through repeated movement exposure, thereby enhancing sensory integration and postural control.[11,13] Taçalan et al highlighted that while repositioning maneuvers offer immediate symptom resolution, vestibular exercises are crucial for long-term recovery and recurrence prevention.[19] The combined intervention in this study integrates these benefits; the repositioning maneuver addresses the mechanical aspect of BPPV, while the exercises facilitate central adaptation and functional improvement. Raj Kumar et al also demonstrated that multimodal vestibular rehabilitation is more effective than single-modality approaches.[20]

The substantial size of the effect suggests that it is statistically and clinically meaningful. The magnitude of improvement exceeded established thresholds for meaningful change, indicating that the combined intervention provides noticeable benefits for patients. These findings support the implementation of comprehensive rehabilitation strategies in clinical practice. This study indicates that incorporating the Gans repositioning maneuver into vestibular rehabilitation exercises enhances outcomes for individuals with posterior canal BPPV, where other maneuvers show limited access to cervical mobility. This combined approach may reduce persistent dizziness, increase balance confidence, and accelerate recovery, providing physiotherapists with a practical, evidence-based intervention.

The study had certain limitations that should be considered while interpreting the findings. Since the study was conducted in a single clinical setting, the results may not be generalizable to other populations or healthcare settings. Although the sample size was statistically adequate, a larger sample could have provided more reliable results and improved the generalizability of the findings. In addition, psychological factors such as fear of falling, anxiety, and depression were not assessed separately, even though they may influence patients' confidence in maintaining balance and performing daily activities.

CONCLUSION

The combination of the Gans repositioning maneuver and Cawthorne–Cooksey exercises is significantly more effective than exercises alone in improving dizziness and balance confidence in individuals with posterior canal BPPV. Also, this approach can be used for those who have limited cervical mobility where other maneuvers are contraindicated. This approach addresses both the mechanical and functional aspects of the condition and should be incorporated into routine physiotherapy practice.

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