

Retrospective Comparison of Outcomes for Patients with Benign Paroxysmal Positional Vertigo Based on Length of Postural Restrictions

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ABSTRACT

Purpose: Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo in older adults. The effectiveness of the repositioning maneuver as an intervention has been established in the literature; however, the efficacy of the post-treatment instructions has not been established. The purpose of this retrospective study was compare treatment outcomes for patients receiving 24 hour postural restrictions posttreatment versus 48 hour restrictions. **Methods:** Medical records of 76 patients diagnosed with BPPV at an outpatient physical therapy practice were reviewed. The average age was 61.05 years (SD 16.16). A positive outcome was determined by partial or complete resolution of symptoms, defined as a reduction in the number of special tests or positions that provoked symptoms from initial examination to discharge, as well as a reduction in vertigo intensity ratings. **Results:** Patients in both groups experienced significant reductions in the number of symptom provoking positions, positive special tests, and ratings of vertigo intensity following treatment. Mean ratings of vertigo intensity on a 10 point scale were 5.71 pre and 1.83 post for the 24 hour group, and 6.75 pre and 3.00 post for the 48 hour group. Positive treatment outcomes were experienced by 95.4% of patients in the 24 hour group (n=63), with 53% (n=35) achieving complete resolution. **Conclusion:** Patients experienced positive treatment outcomes regardless of the length of postural restrictions following repositioning maneuver for BPPV. Therapists can reduce the length of postural restrictions to 24 hours upright following a repositioning maneuver without adversely affecting patient outcomes.

Key Words: benign paroxysmal positional vertigo (BPPV), dizziness, postural restrictions

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo in adults. It is characterized by bouts of severe symptoms that impact the quality of life for 64 out of 100,000 people across the nation.¹⁻² Symptoms associated with BPPV may be caused by otoconia that trigger abnormal stimulation within the semicircular canals of the inner ear. During

head movement, patients report symptoms of acute vertigo, nausea, and dizziness. Nystagmus, or abnormal eye movement, is considered the hallmark sign of BPPV.³⁻⁷ Since certain head positions exacerbate symptoms, patients may self limit their activities, thus affecting social, psychological, and physical aspects of daily living. The etiology of BPPV is considered idiopathic although there may be increased susceptibility among persons with head and neck trauma, infections, inner ear disorders, and advanced age.⁵ In particular, BPPV is the most common cause of dizziness among older adults⁷⁻¹¹ accounting for 26% of all dizziness.¹⁰

This disorder can be seen in any age group, but incidence and prevalence increases with increasing age.^{1,7,8,12} Specifically, incidence of BPPV increases with each decade¹³ and peaks in the 6th and 7th decade.^{8,10} Baloh¹⁴ reported that this disorder is most common between the ages of 60 and 70. Among all patients seen with a complaint of dizziness over a 5-year period (n=358), Herdman & Tusa¹⁵ reported an increasing incidence of BPPV based on age distribution, affecting a third of patients ages 80-89. Not only are the elderly at increased risk for BPPV,¹⁶ the disorder may be more common than previously recognized.^{17,18} In one study, 9% of randomly selected geriatric patients had undiagnosed BPPV, which was related to impaired activities of daily living and falls. Several authors note that women are more commonly affected than men.^{1,14,19} Given the incidence and prevalence of BPPV among older adults, it is important to examine the evidence surrounding management of this disorder.

The Dix-Hallpike test is used to confirm the presence of BPPV and determine the specific canal(s) affected^{3,4,6,7} based on the direction of nystagmus.⁵⁻⁷ Treatment provided by a physical therapist typically involves a repositioning maneuver, which entails moving the patient's head through a specific sequence of positions designed to relocate the otoconia back into the vestibule.¹¹ Moving the otoconia out of the semicircular canals reduces or eliminates symptoms of positional vertigo that occur with specific head movement, and fosters the patient's return to usual activities of daily living. The efficacy of repositioning maneuvers has been extensively documented in the research literature,^{1-3,20-27} including studies with large sample sizes,^{5,24,26} as well as prospective randomized clinical controlled trials.^{2,7,20-23} Efficacy of repositioning maneuver in the treatment of BPPV has also been supported by systematic review in the Cochrane database.²⁵

While there is strong support for the use of repositioning maneuvers to reduce the symptoms of BPPV, research surrounding posttreatment instructions is lacking.^{1,4,20-27} Instructions following a repositioning maneuver can vary greatly depending on the clinic and research literature source.^{18,28,29} Examples include postural restrictions such as instructing patients to remain

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upright (including sleeping) for 1 to 2 days,^{3,5,12,18,20,22,29} wearing a cervical collar,^{3,29} avoiding certain head movements,^{2,3,29} or avoiding lying on the involved side for 1 week.^{3,18,20} The rationale behind postural restrictions following treatment is to prevent the otoconia from becoming dislodged again following a repositioning maneuver, resulting in the return of symptoms.^{7,11} Although prevalent in the clinic, the necessity of posttreatment instructions of any duration has not been substantiated in the literature, and their use may be placing an unnecessary hardship on patients who must endure upright positioning (including sleeping) for 48 hours. In 2005, researchers began to question and explore posttreatment instructions involving upright positioning. Roberts et al²⁸ examined posttreatment instructions in 42 patients who were diagnosed with BPPV of the posterior canal and suggested that posttreatment restrictions may not be necessary to achieve symptom reduction.

There are several potential benefits to reducing or eliminating postural restrictions following treatment. Reducing time required in the upright position would permit a quicker return to patients' usual activities of daily living and improve quality of life following treatment. Additionally, decreasing the time spent upright could foster patient adherence with posttreatment instructions. Determining whether treatment outcomes differ based on the length of time for postural restrictions could assist physical therapists in providing quality care to their patients based on principles of evidenced-based practice.

We chose to investigate the impact of posttreatment postural restrictions through a retrospective review of treatment outcomes for patients who had previously received posttreatment instructions of differing time frames. The purpose of this study was to compare outcomes for patients with BPPV receiving posttreatment instructions to maintain upright posture for 24 hours with those instructed to maintain upright posture for 48 hours.

METHODS

Design

After previously issuing instructions for patients to remain upright for 48 hours posttreatment, physical therapists at an outpatient physical therapy practice had switched to issuing instructions for patients to remain upright for 24 hours postrepositioning. This change in clinical practice was implemented after one of the therapists attended continuing education during which the speaker questioned whether there was evidence to support the need for 48 hour postural restrictions. In order to determine if there was a difference in outcomes following treatment based on these instructions, a retrospective review of patient records was conducted for all patients with a diagnosis of BPPV treated during the years immediately preceding and following this change in clinical practice. To maintain confidentiality, records were referred to by a case number assigned by the clinic coordinator prior to the beginning of data collection. Charts were then examined by outside investigators who were not involved in patient care at this practice in order to determine the treatment outcomes following treatment for BPPV.

The presence of posterior canal BPPV was established by a positive Dix-Hallpike test through therapist observation of nystagmus and patient report of vertigo. Patient history and eye findings in response to positional testing are the gold stan-

dards for diagnosis of BPPV.^{16,19} Specialized equipment such as infrared videography enhances observation of eye movements but is not common in clinical practice.¹⁶ Several authors have reported that diagnosis can be made by direct visualization of eye movements in response to Dix-Hallpike testing^{2,12,22} consisting of positional rotary nystagmus with characteristic features of brief onset latency, limited duration, and adaptation to repeated testing.²² White et al¹⁸ noted that the maneuver needs no special equipment, however, use of infrared video or Frenzel lenses, which eliminate visual fixation, can aid in visualization of nystagmus. In a systematic review of the literature, Hilton & Pinder¹⁹ cautioned that testing patients wearing Frenzel lenses increased the sensitivity but reduced specificity of the maneuver since asymptomatic normal subjects could develop positional nystagmus when optic fixation was eliminated.

Information gathered from initial examination and discharge notes included: self reported ratings of vertigo intensity on a 0 - 10 point scale, vertigo frequency, results of the Dix-Hallpike test, the overall number of positive special tests, the number of positions in which vertigo was elicited, and the duration (in seconds) of provoked symptoms. The length of posttreatment instructions and episode of care were also recorded. Examples of special tests listed on the Initial Examination (IE) form included Romberg, sharpened Romberg with eyes open/closed, Fukuda stepping test, and tandem walking. Also included on the IE form were a series of position changes that therapists used to determine which movements provoked patient symptoms, such as rolling right/left, sitting to/from sidelying, bending down, or looking up.

Subjects

The medical records of all patients diagnosed with BPPV were reviewed (n=85). There were 76 patients with unilateral symptoms, and 9 patients with bilateral symptoms. For purposes of data analysis, only patients with unilateral BPPV were included (Table 1). Sixty-six patients received 24 hour post-treatment instructions while 10 patients received 48 hour post-treatment instructions. The mean age of the entire sample was 61.05 years (SD 16.16). Mean age in the 48 hour group was less than that of the 24 hour group, but this difference was not statistically significant ($t_{(74)}=1.28$; $p=.21$). Table 2 shows the age distribution of patients by decade. Patients 60 years and older comprised 56.6% of the total sample, and 60.6% of patients in the 24 hour upright group.

Table 1. Descriptive Characteristics of Subjects

	Total Group	24 Hour Group	48 Hour Group
Number	76	66	10
Males n(%)	23 (30.2%)	20 (30.3%)	3 (30%)
Females n(%)	53 (69.7%)	46 (69.7%)	7 (70%)
Average Age (in years) Mean (SD)	61.05 (16.16)	61.97 (15.63)	55.00 (19.06)
Episode of Care (#days) Mean (SD)	36.06 (49.65)	35.32 (49.57)	47.25 (57.04)

Table 2. Age Distribution for Patients with Unilateral BPPV

Age by Decade (years)	Total Group (n = 76)	24 Hour Group (n = 66)	48 Hour Group (n = 10)
20 - 29	3 (3.9%)	2 (3.0%)	1 (10.0%)
30 - 39	4 (5.3%)	3 (4.5%)	1 (10.0%)
40 - 49	13 (17.1%)	11 (16.7%)	2 (20.0%)
50 - 59	13 (17.1%)	10 (15.2%)	3 (30.0%)
60 - 69	12 (15.8%)	12 (18.2%)	0
70 - 79	21 (27.6%)	19 (28.8%)	2 (20.0%)
80 - 89	10 (13.2%)	9 (13.6%)	1 (10.0%)

Data Analysis

Comparisons of treatment outcome measures from initial evaluation to discharge were made based on pre- to postvalues for the total group, and for each individual group using paired t-test analyses with SPSS 13.0. Changes in self reported ratings of vertigo intensity were analyzed via Wilcoxin signed ranks test for ordinal data.

Effectiveness of treatment was determined by partial or complete resolution of symptoms. Complete resolution of symptoms was operationally defined as the subjective report of the abolishment of symptoms (0/10 intensity level of vertigo), along with a negative Dix-Hallpike, and no positive special tests or positions reproducing symptoms. Partial resolution of symptoms was operationally defined as a decrease in overall vertigo intensity level, with reduced number of positive positions, and reduced response to Dix-Hallpike from pretest to posttest. Patients who experienced complete or partial symptom resolution were considered to have a positive treatment outcome. No resolution of symptoms was defined as no change in vertigo intensity level, or in the number of positive symptom provoking positions, or response to Dix-Hallpike. Worsening of symptoms was indicated by an increase in vertigo intensity level, in conjunction with the continued positive Dix-Hallpike and/or increased number of positive positions.

RESULTS

Analysis of individual treatment outcomes measures for patients revealed that both groups experienced significant improvement from pretest to posttest, with a decreased number of symptom provoking special tests or positions, and a reduction of vertigo intensity ratings (Table 3). Significance

level for data analysis was set at $p < .05$ (2 tailed). For the total group, fewer special tests provoked symptoms posttreatment with means as follows: .89 pre and .22 post ($t_{(73)}=5.36$). There also were significantly fewer symptom provoking position changes: 2.86 pre and .70 post ($t_{(72)}=7.66$). Wilcoxin signed ranks test revealed a significant reduction in ratings of vertigo intensity post treatment with a mean of 5.88 pre and 2.02 post ($T=12.5$; $p < .05$).

Analysis of treatment outcomes by group revealed that for the first outcome measure, patients receiving 24 hour instructions (n = 66) had fewer symptom provoking special tests with a means of .69 pre and .14 post ($t_{(63)}=5.24$). Likewise, patients receiving 48 hour posttreatment instructions (n = 10) had fewer symptom provoking special tests, with a mean of 2.71 pre and 1.00 post ($t_{(6)}=2.29$). For the second outcome measure, the 24 hour group had fewer symptom provoking positions, with a mean of 2.38 pre and .25 post ($t_{(63)}=9.76$). The 48 hour group also had fewer symptom provoking positions with a mean of 6.33 pre and 3.89 post ($t_{(8)}=1.37$; $p = .21$) but this difference was not significant (Table 3). For the final outcome measure, Wilcoxin signed ranks test revealed a significant reduction in vertigo intensity ratings for post-treatment patients with 24 hour instructions, with a mean of 5.71 pre and 1.83 post ($T=9.5$; $p < .05$). Patients in the 48 hour group also experienced significant reductions in vertigo intensity ratings, with a mean of 6.75 pre and 3.00 post ($T = 0$; $p < .05$).

A positive treatment outcome (operationally defined as either complete or partial recovery) was experienced by 92.1% (n = 70) of patients in the total group, including 95.4% (n = 63) of patients in the 24 hour group, and by 70.0% (n = 7) in the 48 hour posttreatment group (Table 4). In comparing each category of recovery, half of the entire sample (50.0%; n=38) experienced complete resolution of symptoms following treatment, 42.1% (n=32) had partial resolution, 3.9% (n=3) experienced no change, and 3.9% (n=3) had a worsening of symptoms. Further comparison of each category of recovery according to length of postural restrictions revealed that more than half (53.0%; n=35) of the patients in the 24 hour group had complete resolution compared to the 30.0% (n=3) in the 48 hour group.

The length of episode of care was also taken into consideration. The average episode of care was 35.32 days (SD 49.57) for the 24 hour group, and 47.25 days (SD 57.04) for the 48 hour group but this difference was not statistically significant.

Table 3. Pre- Postcomparison of Primary Outcome Measures

Outcome Measures	Evaluation	Total Group Mean (SD)	24 Hour Group Mean (SD)	48 Hour Group Mean (SD)
Number (+) Special Tests	Initial	.89 (1.14)	.69 (.91)	2.71 (1.49)
	Final	.22 (.61)*	.14 (.47)*	1.00 (1.15)*
Number (+) Positions	Initial	2.86 (2.37)	2.38 (1.77)	6.33 (3.20)
	Final	.70 (2.17)*	.25 (.64)*	3.89 (5.11)
Vertigo Intensity Rating	Initial	5.88 (3.08)	5.71 (3.09)	6.75 (3.05)
	Final	2.02 (2.95)*	1.83 (2.81)*	3.00 (3.66)*

Key: * Significant differences ($p < .05$) from pre- to posttest

Table 4. Classification of Recovery Following Repositioning Maneuver

	Total Group (n=76)	24 Hour Group (n=66)	48 Hour Group (n = 10)
Complete	38 (50.0%)	35 (53.0%)	3 (30.0%)
Partial	32 (42.1%)	28 (42.4%)	4 (40.0%)
No Change	3 (3.9%)	2 (3.0%)	1 (10.0%)
Worsening of Symptoms	3 (3.9%)	1 (1.5 %)	2 (20.0%)

DISCUSSION

The majority of patients in this retrospective review of records experienced positive treatment outcomes, with either complete or partial resolution of symptoms following repositioning maneuver for treatment of BPPV. This was evident by the significant decrease in the number of positive special tests, positive symptom provoking positions (including Dix-Hallpike), and intensity of vertigo from initial assessment to discharge. The results of this study suggest that both posttreatment options were effective in maintaining symptom resolution following a repositioning maneuver for patients with BPPV. Of particular clinical relevance was the finding that reducing the postural restriction time to 24 hours upright posttreatment did not adversely affect treatment outcomes. The large number of patients in this group supports the findings that positive treatment outcomes were achieved with less burdensome time frames for postural restriction posttreatment.

White et al¹⁸ noted that clinics continue to recommend post procedure postural restrictions based on anecdotal experience. Based on our results, continuing to advise patients to remain upright for 48 hours following a repositioning maneuver places an unnecessary burden on patients and cannot be justified. Our findings are of particular relevance given that 48 hour upright posttreatment instructions following a repositioning maneuver have been presented in research studies published as recently as 2006.²⁵ Although noted in the literature and used by many clinics, lengthy postural restrictions place an unnecessary burden on patients who require treatment for BPPV. Our findings support previous authors^{28,30} who questioned the need for lengthy upright postural restrictions posttreatment. The results presented through this research support reducing the posttreatment instruction time by half, while still achieving positive treatment outcomes. By reducing the burden of maintaining an upright position for 48 hours, patients can return to activities of daily living quicker with the same symptom resolution. Moreover, a shorter time frame may also increase patient adherence to postural restrictions following the repositioning maneuver. Awareness of these findings is particularly important for therapists working with older adults, since older adults are at increased risk for BPPV¹⁶ and given the incidence and prevalence of this disorder among the elderly.^{1,7,8,13,14} Based on our results, therapists can reduce the length of postural restrictions following treatment without fear of adversely affecting outcomes.

The treatment outcomes experienced by patients in this sample fall within the range of treatment outcomes following repositioning maneuver reported in the literature. In the current sample, 53.0% of patients in the 24 hour group achieved

complete symptom resolution while 50.0% of patients in the total group were asymptomatic at discharge. Several studies in the literature report complete resolution of symptoms following a single repositioning maneuver with recovery rates that range from 80% to 89%.^{7,11,26,28} However, earlier studies with smaller samples (n < 39) report fewer patients achieving symptom resolution following a single repositioning maneuver, ranging from 44% to 74%.^{20,29} In studies with large sample sizes exceeding 500 patients,^{5,26} the percentage of patients with symptom resolution was reported to be 67% to 84%. The smaller size of our sample may have influenced recovery rates. In some cases, outcomes were based solely on the conversion of a positive Dix-Hallpike test to a negative test following treatment,²⁶ while other studies included patients with improvement in symptom status or a reduction in nystagmus.^{14,30} While not all of our patients experienced complete resolution, the vast majority had positive treatment outcomes achieving complete or partial symptom resolution. Blatt et al²⁹ noted that postural difficulties persist for some patients with BPPV even after successful remission of vertigo and nystagmus, and these postural difficulties require further physical therapy interventions. This was true in the current sample as well. Stringent application of our recovery classification definitions meant that patients who had positive findings on special tests such as Romberg or tandem walking following CRM were categorized as having partial resolution, even when the Dix-Hallpike test results were negative. In addition, residual postural difficulties may have increased the length of the episode of care, particularly for patients in the current study with BPPV related to the co-morbidity of traumatic head injury.

Finally, our results are particularly promising for therapists who see patients in the outpatient setting without access to a balance or vestibular disorders specialty clinic. The findings have strong clinical utility, or practicality, for most therapists working with older adults since diagnosis and treatment were based on clinical tests, measures, and interventions accessible to all clinics. In a previous randomized trial, researchers²² relied upon clinical results of Dix-Hallpike testing as their inclusion criteria. All patients in the study also underwent bedside vestibular testing including oculomotor tests, positional tests, Romberg and tandem gait tests.

Limitations

There were several limitations in this study that must be considered when examining the results. First, in this retrospective study the records of all patients in a cohort were reviewed and there was no mechanism to control sample distribution. As such, there were a greater number of patients who received 24 hour posttreatment instructions. The substantial difference in group sizes limited our ability to make direct comparisons to determine whether they were equally effective in producing positive treatment outcomes. Instead, pre- and postdata for each group was presented. A prospective study with random group assignment would lead to more equal distribution among the groups for comparison. The most that can be said is that both groups improved regardless of the length of postural restrictions issued in the post treatment guidelines.

A second limitation was that this study was completed at a single outpatient clinic. This potentially limits the degree to

which the findings from this study can be generalized to the larger population of patients diagnosed with BPPV. However, the current sample of patients was similar to previous studies with respect to gender distribution (females > males)^{1,2,5,14,26,28} and age range,^{1,4,10,12,13,29} which enhances the credibility of our findings, particularly for the 24 hour group. Hilton and Pinder¹⁹ reported BPPV is twice as common in females, which is similar to our distribution.

Inconsistencies in documentation, a particular challenge for retrospective reviews of patient records, were noted. Missing data on the outcome measures of vertigo frequency and duration of provoked symptoms precluded analysis of these specific measures. At times, there was inconsistent collection of data regarding patients' symptoms. For example, for some patients, vertigo intensity was documented as mild/moderate/severe, instead of ratings on a 0-10 scale. As such, data analysis was limited to those outcome measures present in the majority of medical records. This contributed to the small number of patients in the 48 hour group with complete data for analysis.

Patient adherence to protocol was another extraneous variable for consideration. All patients received written copies of the posttreatment instructions, which was documented in the charts. However, there was no mechanism established for confirmation of patient adherence to their posttreatment instructions. In future studies, several strategies could address this. Follow-up by phone, having patients explain/demonstrate their protocol at next clinical visit, or recording their activities recording via a written log book could serve as mechanisms to confirm adherence to posttreatment instruction protocol.

Despite the limitations, the results of this study demonstrate that positive treatment outcomes were achieved for patients with BPPV when repositioning maneuver was used along with the 24 hour posttreatment instructions for upright postural restrictions. The high incidence of positive outcomes in the 24 hour group suggests that the lengthier 48 hour upright positioning is not needed. The implication for clinical practice is that therapists can reduce the time frame for postural restrictions following a repositioning maneuver without concerns of negatively impacting patient outcomes. The effectiveness of the 24 hour postural restrictions presents clinicians with treatment guidelines that are less burdensome and that could potentially increase patient adherence and satisfaction.

Future Research

A prospective randomized, controlled study to assess the efficacy of posttreatment instructions for patients with BPPV should be considered for further study. Mechanisms to insure consistency of documentation and monitor protocol adherence should be implemented. Including standardized measures of perceived disability such as the Dizziness Handicap Inventory would also be recommended. In addition, a prospective study investigating the long-term outcomes and recurrence rates would be beneficial in assessing the overall efficacy of postural restrictions following repositioning maneuvers. While current findings support a reduction in the time frame for postural restrictions following treatment for BPPV, further study may determine whether therapists can eliminate postural restrictions all together following repositioning maneuvers. Eliminating the burden of postural restrictions

would be particularly beneficial for older adults. Our second phase of investigation is an ongoing prospective study with patients randomly assigned to groups receiving posttreatment instructions of differing time frames, including no postural restrictions. Preliminary analysis suggests that patients may be able to return to usual activities following CRM, without need for any postural restrictions.³¹

CONCLUSION

The effectiveness of repositioning maneuvers in achieving resolution of symptoms associated with BPPV has been well established in the literature. The extent to which posttreatment postural restrictions impact outcomes is uncertain. In this retrospective study, maintaining an upright position for 24 hours following a repositioning maneuver produced positive treatment outcomes for patients. Continuing to advise patients to remain upright for 48 hours following a repositioning maneuver places an unnecessary burden on patients and cannot be justified. This information can significantly affect the quality of life for people with BPPV by reducing the burden of upright positioning and fostering a quicker return to their usual activities of daily living with the same positive outcome. These findings are of particular relevance to therapists working with older adults who are at increased risk for this disorder. We encourage therapists to offer posttreatment guidelines supported by evidence rather than anecdotal experience. Future randomized, controlled prospective studies are recommended to compare treatment outcomes for patients who observe postural restrictions for 24 hours vs. return to usual activities without postural restrictions.

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- Reimbursement Issues in Healthcare: Understanding the Medicare and Medicaid System
- Breast Cancer: The Role of the Physical Therapist

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- Bariatric Geriatrics: Physical Therapy Management of Older Adults Who are Obese
- Fall Prevention

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- Beyond Quad Sets: Therapeutic Exercise for Today's Older Adult
- The Older Adult With Chronic Obstructive Pulmonary Disease
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