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Brief Reports

MANAGEMENT OF BENIGN PAROXYSMAL POSITIONAL VERTIGO: A RANDOMIZED CONTROLLED TRIAL

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Abstract—Background: Benign paroxysmal positional vertigo (BPPV) is a common presenting problem. **Objective:** Our aim was to compare the efficacy of vestibular rehabilitation (maneuver) vs. conventional therapy (medications) in patients presenting to the emergency department (ED) with BPPV. **Methods:** This was a prospective, single-blinded physician, randomized pilot study comparing two groups of patients who presented to the ED with a diagnosis of BPPV at a Level 1 trauma center with an annual census of approximately 75,000. The first group received standard medications and the second group received a canalith repositioning maneuver. The Dizziness Handicap Inventory was used to measure symptom resolution. **Results:** Twenty-six patients were randomized; 11 to the standard treatment arm and 15 to the interventional arm. Mean age \pm standard deviation of subjects randomized to receive maneuver and medication were 59 ± 12.6 years and 64 ± 11.2 years, respectively. There was no significant difference in mean ages between the two treatment arms ($p = 0.310$). Two hours after treatment, the symptoms between the groups showed no difference in measures of nausea ($p = 0.548$) or dizziness ($p = 0.659$). Both groups reported a high level of satisfaction, measured on a 0–10 scale. Satisfaction in subjects randomized to receive maneuver and medication was 9 ± 1.5 and 9 ± 1.0 , respectively; there was no significant difference in satisfaction between the two arms ($p = 0.889$). Length of stay during the ED visit did not differ between the treatment groups ($p = 0.873$). None of the patients returned to an ED for similar symptoms. **Conclusions:** This pilot study shows promise, and would suggest that there is no difference in symptomatic

resolution, ED length of stay, or patient satisfaction between standard medical care and canalith repositioning maneuver. Physicians should consider the canalith repositioning maneuver as a treatment option. © 2014 Elsevier Inc.

Keywords—vestibular rehabilitation; benign paroxysmal positional vertigo; ED

INTRODUCTION

Vertigo is a common complaint of patients who seek care in the emergency department (ED) (1). Vertigo is a frequent symptom in the general population, with a 12-month prevalence of 5% and an incidence of 1.4% in adults; its prevalence rises with age and is about two to three times higher in women than in men (2). Benign paroxysmal positional vertigo (BPPV) is characterized by brief periods of vertigo triggered by a change in the position of a person's head relative to gravity (3). It is the most common disorder, accounting for one third of vestibular diagnoses in the general population (4). It was first described by Barany in 1921 and was later described in more detail by Dix and Hallpike in 1952 (5,6).

It is common practice for ED physicians to treat these patients symptomatically with benzodiazepines, antihistamines, or anticholinergic medications (7). The canalith repositioning maneuver was developed by Epley (8). This

repositioning maneuver is considered an effective treatment for BPPV (9). However, many existing studies have used a sham/placebo in the comparator arm (10–14).

We set out to compare the efficacy of vestibular rehabilitation vs. conventional therapy in ED patients who present with BPPV. In particular, we sought to evaluate the improvement of vertigo in patients diagnosed with BPPV in the ED, assess their disposition time, and compare patient satisfaction between those patients who receive standard care vs. those who received vestibular rehabilitation.

METHODS

This was a prospective, single-blinded physician, randomized pilot study comparing two groups of patients who presented to the ED with a diagnosis of BPPV at a Level 1 trauma center with an annual census of approximately 75,000. After Institutional Review Board approval and clinical trial registration, we enrolled subjects during weekday hours from February 2006 through December 2009. The first group received standard treatment of medications to alleviate their symptoms, and the second group received vestibular rehabilitation treatment with the canalith repositioning maneuver.

The algorithm for treatment can be viewed in [Figure 1](#). BPPV was diagnosed based on findings obtained from the Dix-Hallpike maneuver (DH) by a blinded physician assessor. We considered the DH test positive, consistent with the literature, when the maneuver elicited reproducible vertigo and exhibited a brief latency period, with fatigability and reversal of the nystagmus on return to upright (15). For purposes of this trial, the nystagmus resolved or fatigued in < 60 s. If the DH test was positive, inclusion and exclusion criteria were applied and the patient was approached for consent and enrollment.

To be included in the study, patients had to be at least 18 years of age, presenting to the ED weekdays during business hours, and have a positive DH test. Patients were excluded if they had taken any antihistamines or anticholinergics within the past 12 h, if they were unable to ambulate, had severe cervical spine disease or known cerebral vascular disease, or had any positive findings during the neurological examination during physical examination that caused concern that the primary diagnosis was not BPPV. Patients were also excluded if they had known Meniere's disease; any cardiac complaints; loss of consciousness; previous enrollment; mental conditions that rendered them unable to understand the nature, scope, and consequences of the study; or were unlikely to comply with the study, such as those with uncooperative attitudes or any other condition that could confound or interfere with evaluation or prevent compliance with the study protocol. Patients who had a negative finding of

vertigo and nystagmus when the DH maneuver was performed by the physical therapist or a trained research staff nurse were also excluded, even if the patient had a positive finding of vertigo and nystagmus when the DH maneuver was performed by the physician or resident.

Inter-rater reliability analysis was completed by the physical therapists and nurse researchers before the study using video analysis of nystagmus and post test of technique by a physical therapist certified in vestibular rehabilitation.

After consent and the DH confirmed to be positive with involvement of unilateral or bilateral ears by the therapist/research staff nurse, the patients were randomized into one of the treatment arms using a computer-generated sequence. The control group received medications to alleviate their symptoms as per provider preference, including treatments such as benzodiazepines, antihistamines, antiemetics, and IV fluids. The experimental group received treatment with the canalith repositioning maneuver. The canalith repositioning maneuver was repeated up to two times, if necessary, during the ED visit to attempt full resolution of symptoms.

In both groups, the research staff assessed for symptom resolution every 15 min for the first hour, then every 30 min up to 2 h or until symptom resolution or physician reassessment is complete using a visual analogue scale, one measuring dizziness and another to measure nausea. There was then a repeat assessment of the DH on patients in both groups. Those patients who were in the experimental group who continued to have symptoms at 2 h after treatment with the canalith repositioning maneuver were considered treatment failures and were treated with medications as deemed appropriate by the ED physician. Patients were discharged with either standard instruction for follow-up or, in the case of the intervention group, with instructions to follow-up with physical therapy or a vestibular clinic.

Phone follow-up assessing any repeat ED visits and satisfaction with their treatment, and the Dizziness Handicap Inventory short form ([Figure 2](#)) measure was performed (a previously validated tool for measurement of nausea and dizziness on a severity scale) (16).

The study protocol allowed for statistical consultation and data peak power interim analysis conduction to calculate the exact sample size needed to complete the study. The study was terminated at this analysis because the hypothesis had already been tested and changes in prehospital protocols that allowed medications to be given precluded reasonable continued enrollment.

Statistical Methods

Incidence rates and categorical variables were summarized and reported using counts, percentages, and exact

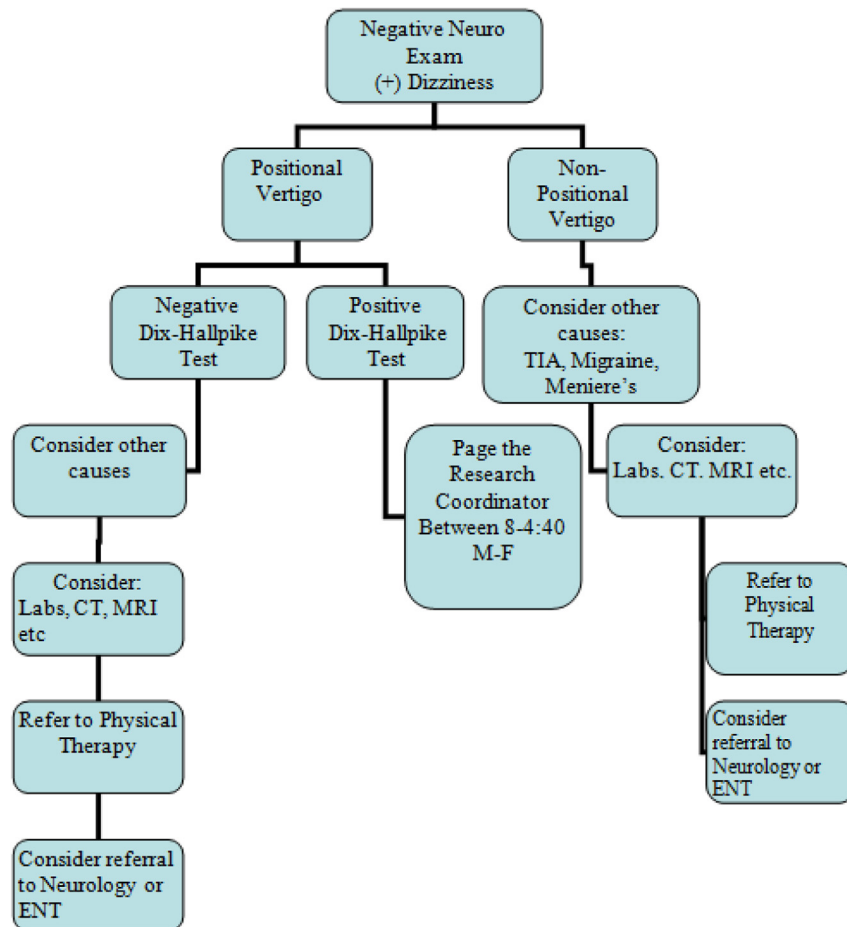


Figure 1. Algorithm for treatment of benign paroxysmal positional vertigo. TIA = transient ischemic attack; CT = computed tomography; MRI = magnetic resonance imaging; ENT = ear, nose, and throat.

95% binomial confidence intervals. Differences between the proportions by randomized treatment assignment were compared using a two-tailed Fisher's exact test. Continuous variables were summarized using means, standard deviations, and 95% confidence intervals and compared using a one-factor (randomized treatment assignment) analysis of variance test. Multinomial parameters, such as patient satisfaction (0–10 score) and the Dizziness Handicap Inventory (0–13 score) were compared using a Wilcoxon two-sample test. Probability values < 0.05 were considered significant; p values > 0.1 but ≥ 0.5 were considered highly suggestive of a significant difference. All analyses were conducted using SAS software, version 9.2 (SAS Institute, Cary, NC).

RESULTS

Twenty-six patients were randomized and enrolled; 11 into the standard treatment arm and 15 into the interventional arm. Two subjects in the interventional arm were considered treatment failures. One did not complete

due to nausea, and the second received the manipulation and then needed medication. See the CONSORT (Consolidated Standards of Reporting Trials) diagram in Figure 3. Ages (mean \pm standard deviation [SD]) of subjects randomized to receive maneuver and medication was 59 ± 12.6 years and 64 ± 11.2 years, respectively; there was no significant difference in the patient age between the two treatment arms ($p = 0.310$). Although not significant ($p = 0.111$), there was a considerable difference in sex between the two treatment groups; 67% females in the maneuver group vs. 27% in the medication group. Two hours after the initiation of treatment, the symptoms between the two groups showed no difference in the primary outcome measures of nausea ($p = 0.548$; maneuver mean = 4.0 and median = 1.0; medication mean = 8.0 and median = 3.0) or dizziness ($p = 0.659$; maneuver mean = 9.0 and median = 6.0; medication mean = 14.0 and median = 5.0).

Both groups of patients reported a high level of satisfaction as measured on a 0–10 scale. Satisfaction in patients randomized to receive maneuver and medication

1. Does looking up increase your problem?
2. Because of your problem, do you restrict your travel for business or recreation?
3. Because of your problem, do you have difficulty getting into or out of bed?
4. Because of your problem, do you have difficulty reading?
5. Do quick movements of your head increase your problem?
6. Because of your problem, do you avoid heights?
7. Does turning over in bed increase your problem?
8. Because of your problem, is it difficult for you to go for a walk by yourself?
9. Does walking down a sidewalk increase your problem?
10. Because of your problem, is it difficult for you to walk around your house in the dark?
11. Because of your problem, are you afraid to stay home alone?
12. Because of your problem, are you depressed?
13. Does bending over increase your problem?

Figure 2. Dizziness Handicap Inventory short form.

was 9 ± 1.5 and 9 ± 1.0 , respectively; there was no significant difference in satisfaction of patients between the two treatment arms ($p = 0.889$) (Figure 4).

The length of stay (LOS) during the ED visit did not differ between the randomized treatment groups ($p = 0.873$). The LOS was 338 ± 141 min for patients randomized to receive maneuver and 346 ± 95.9 min for patients randomized to receive medication (Figure 5).

Seventy-three percent of participants were available for phone follow-up at 1 week and all patients were contacted 30 days post procedure. Responses at the 30-day follow-up revealed that there was no difference between the group in the Dizziness Handicap Inventory measure ($p = 0.236$) and no difference in patient satisfaction between the two groups ($p = 0.721$). For the short-form Dizziness Handicap Inventory, based on a 0 (maximum dizziness) to 13 (no dizziness) score, the mean \pm SD scores were 11.9 ± 2.00 for patients randomized to

receive maneuver and 10.7 ± 2.57 for patients randomized to receive medication. None of the patients had returned to an ED for similar symptoms. Six of the 15 (40%) patients in the maneuver group and 3 of the 11 (27%) patients in the medication group did seek other treatment for similar symptoms within 30 days of the primary ED visit; the difference in the proportions was not significant ($p = 0.683$). This same distribution and proportion of patients reported they receive physical therapy or had gone to a vestibular clinic for their condition.

DISCUSSION

The preponderance of the literature, as well as the current study, suggest that the canalith repositioning maneuver should be entertained as standard of care in the ED for treatment of BPPV. Yet, a recent study suggests that use of the DH test in ED patients with dizziness is decreasing

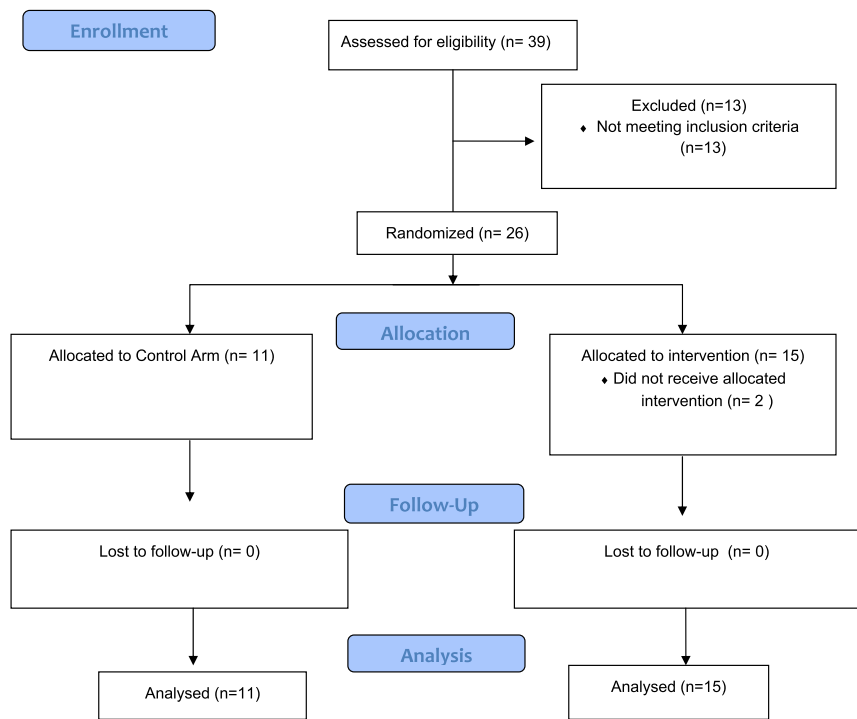


Figure 3. CONSORT (Consolidated Standards of Reporting Trials) diagram.

over time and the canalith repositioning maneuver is used in only 3.9% of those with BPPV (17). What barriers exist that prevent its regular use is difficult to explain. However, it is hoped that this article will help alleviate concerns about LOS, symptom resolution, or patient satisfaction. Considering the cost savings, nursing time, and potential for adverse reactions to medications (even the limits on driving due to sedation) and complications from IV access, it seems that the maneuver has clear advantages for those so motivated to attempt it. This study was facilitated by a therapist and research nurse trained in vestibular rehabilitation. We did not assess, nor do we know of any studies that have assessed, physician to therapist performance of otolith repositioning techniques. The maneuver itself is not complex; further study could determine

what resources could be best utilized in the delivery of the treatment (i.e., nursing staff, resident, or attending physician).

Limitations

Generalizability is brought into question because this was performed at a single site in Pennsylvania. Seven subjects were not available for phone follow-up at 1 week; the strength of the outcomes we report must be weighed against the 27% that cannot be reported.

Although there were no differences observed relative to patient characteristics, additional investigation is warranted to define the response rate in specific patient subsets where maneuver or medication might be contraindicated. In particular, we have not looked at the

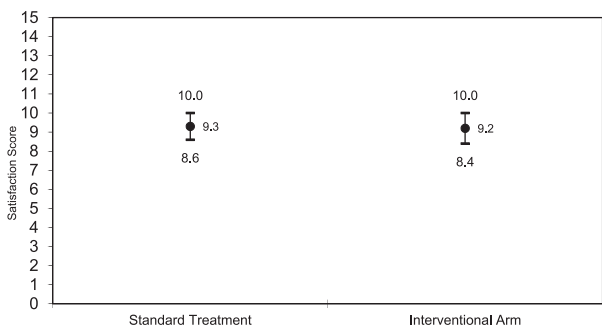


Figure 4. Patient satisfaction with the treatment administered.

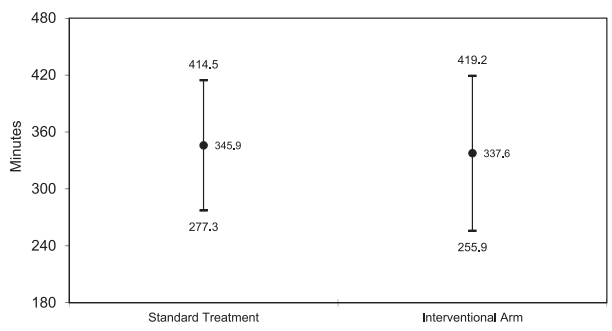


Figure 5. Length of stay (min) in the emergency department.

incidence of BPPV compared with acute vestibular syndrome in our ED, nor can we comment on the incidence in our ED as it compares with other EDs. Additionally, some of our BPPV patients might have had horizontal canal BPPV; while Epley has been demonstrated to be useful in these patients, the frequency and outcome of its use might not be as well documented (18). Patients were only enrolled during weekday hours and this was a causal factor in the lengthy study period. This may have allowed for sampling bias in the population studied.

CONCLUSIONS

Although small in sample size, this pilot study shows promise, and would suggest that there is no difference in symptomatic resolution, ED LOS, or patient satisfaction between standard medical care and canalith repositioning maneuver. Physicians should consider the canalith repositioning maneuver as a treatment option.

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ARTICLE SUMMARY

1. Why is this topic important?

Benign paroxysmal positional vertigo is a common presenting problem to the emergency department (ED).

2. What does this study attempt to show?

We set out to compare the efficacy of vestibular rehabilitation vs. conventional therapy in ED patients who present with BPPV.

3. What are the key findings?

There is no difference in symptomatic resolution and patient satisfaction between standard medical care and canalith repositioning maneuver in this study.

4. How is patient care impacted?

Physicians should consider canalith repositioning maneuver as part of their standard of care.