

of positions. The success rate for a single treatment session is 78%.<sup>6</sup> Another positional exercise is the Brandt-Daroff exercise.<sup>7</sup> Patients perform 5 cycles of the exercise 4 times per day until no symptoms of vertigo are experienced for 2 consecutive days during their daily routine or with the exercises. The Brandt-Daroff exercises are often impractical because patients do not tolerate repeated provocation of symptoms. Brandt-Daroff exercises have a 23% to 98% success rate over a 1- to 2-week period.<sup>7,8</sup>

Although treatment is presently very ~~difficult~~, ~~many~~ ~~often~~ ~~recurs~~. Forty-four percent of patients treated successfully with the canalith repositioning procedure redevelop BPPV within the first 2 years.<sup>6</sup> Therefore, the purpose of this study is to determine if a daily routine of Brandt-Daroff exercises reduces the rate of recurrence of BPPV and increases the time for BPPV to recur. Prevention would improve the patient's quality of life and/or reduce the long-term cost of the medical management of BPPV.

## METHODS

Subjects diagnosed with BPPV-PC and treated successfully with the canalith repositioning procedure were recruited from the practices of J.O.H. and T.C.H. This study was approved by the institutional review boards of Northwestern University, Chicago, Ill, and Midwestern University, Downers Grove, Ill.

To establish the diagnosis of BPPV-PC, a neuro-otologic examination was performed. The patient's response to the Dix-Hallpike maneuver was evaluated using a video Frenzel system (RealEyes; Micromedical Technologies, Chatham, Ill). Three criteria were required for diagnosis: (1) a 1- to 20-second latency before the onset of vertigo and nystagmus, (2) observation of a rotary and/or upward-directed nystagmus in the head-hanging position, and (3) vertigo and nystagmus less than 60 seconds in duration. If BPPV was confirmed, patients were treated with the canalith repositioning procedure with or without vibration as previously described.<sup>6,9</sup> After the maneuver, patients remained seated in the office for 20 minutes. Patients were given verbal and written instructions to sleep semirecumbent for 48 hours and to avoid rapid head movements, extreme flexion and extension of the neck, and positions that provoke symptoms of vertigo, such as placing the involved ear in a dependent position while sleeping, for 1 week.

One week following treatment, the patient's response to the Dix-Hallpike maneuver was evaluated in the clinic. A random sample of convenience was obtained. If patients were cured or much better and agreed to perform the Brandt-Daroff exercises daily, they were placed in the treatment group. If patients were unable to perform the exercises because of physical limitations or lack of motivation, they were placed in the no-treatment group. To increase the number of participants in the no-treatment group, we performed a retrospective chart review to identify patients previously treated for BPPV. Patients recruited through the chart review were either reevaluated in

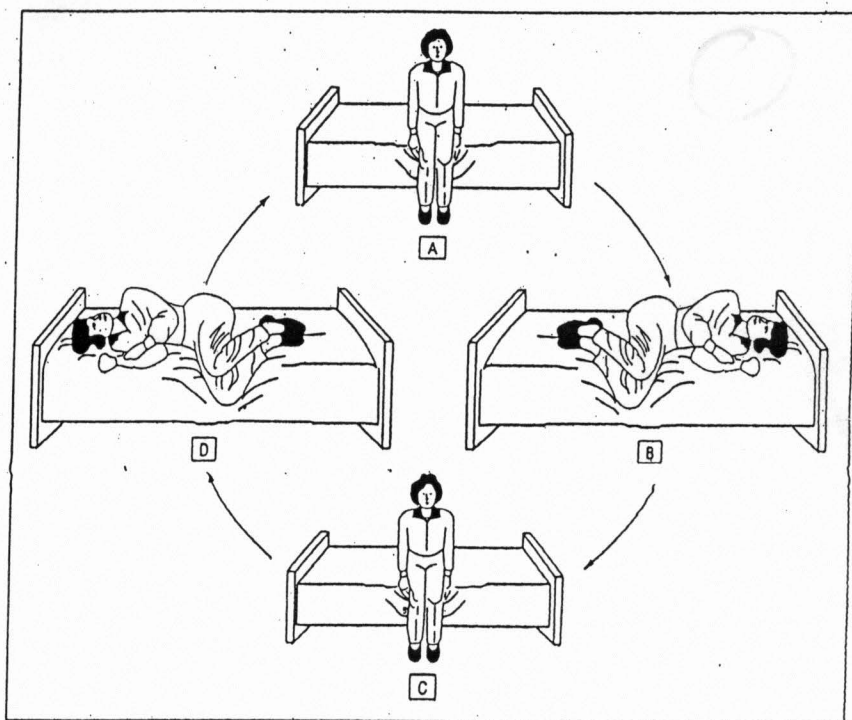


Figure 1. Brandt-Daroff exercises. Each position was maintained for 30 seconds.

the clinic or interviewed by telephone. If reevaluated in the clinic, the patient's response to the Dix-Hallpike maneuver was evaluated. If interviewed by telephone, the patient was instructed to initiate the head or body movement that had previously provoked the symptoms and to report the outcome. Patients were interviewed by telephone if they worked during the day and were unable to take time off from work or if they were from an outlying community and returning to the clinic presented a hardship. Of the patients recruited through the chart review, 49% (n=30) were reevaluated in the clinic while 51% (n=31) were interviewed by telephone.

The patients quantified their symptom intensity on a scale of 1 to 3 (mild, moderate, or severe) prior to the treatment procedure and at the time of follow-up. Results, defined as change, were categorized on a scale of 1 to 4 (cure, much better, better, or no change) based on clinical examination or as reported by telephone at the time of follow-up. If cured or much better, patients were asked to participate in the study and consent was obtained. Patients were excluded from the study if the diagnosis of bilateral BPPV-PC or atypical BPPV was established, if central nervous system involvement was identified based on history, magnetic resonance imaging, or findings of neurological examination, or if an alternative maneuver was performed, such as the Semont maneuver<sup>10</sup> or Brandt-Daroff exercises.<sup>7</sup>

Subjects in the no-treatment group did not perform exercises. Those in the treatment group were trained in and instructed to perform the Brandt-Daroff exercises.<sup>7</sup> Subjects were asked to perform 2 cycles once a day for 2 years. In the Brandt-Daroff exercises the patient moves through a series of 4 positions as illustrated in **Figure 1**, A-D. To begin, the patient is seated on the edge of the bed and the head/neck is rotated 45° toward the right (**Figure 1**, A). The patient rapidly moves into the left side lying position, maintaining the head/neck rotation (**Figure 1**, B). The patient then rapidly sits up with the head slightly flexed forward (**Figure 1**, C). The exercise is repeated toward the opposite side (**Figure 1**, C, D, A). This constitutes 1 cycle of the exercise. Each position is maintained for 30 seconds, the total time being 2 minutes. Subjects were given an illustrated handout of the Brandt-Daroff exercises.