Efficiency of the Deep Head Hanging Maneuver for Anterior Canal Benign Paroxysmal Positional Vertigo

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Abstract. [Purpose] The aim of this clinical study was to determine whether the deep head hanging maneuver (DH maneuver) is an efficacious treatment maneuver for anterior canalithiasis. [Subjects and Methods] Twenty-two adult patients were recruited. Their ages ranged from 41–63 years, with an average age of 53 years. Ten patients were male, and twelve were female. Patients were judged to be “clear” of anterior canalithiasis when there was no nystagmus or subjective vertigo elicited by diagnostic positioning at a follow-up appointment. This study method was supported by other research using the same method. [Results] The results indicated that 77.3% of the twenty-two patients were clear of anterior canalithiasis after one treatment session, with another 18.1% clear after a second treatment session. The remaining 4.5% required a third treatment session. [Conclusion] The deep head hanging maneuver was demonstrated to be a useful treatment in patients presenting with possible anterior canalithiasis. Approximately 95% of the patients were clear after one or two deep head hanging maneuver sessions. 

Key words: Dizziness, Vertigo, Benign paroxysmal positional vertigo and canalithiasis

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is the most common otologic cause of dizziness1, 2). It is caused by abnormal mechanical stimulation of one or more of the three semicircular canals (SCCs) of the inner ear. Within the labyrinth of the inner ear lie collections of calcium crystals known as otoconia2). For a variety of reasons, the otoconia in patients with BPPV are dislodged from their usual position within the utricle and travel through the endolymphatic fluid into one of the SCCs. The presence of the otoconia in one of the SCCs causes the involved semicircular canal to become sensitive to changes in orientation of the head in the plane of the canal. It has been reported that 80–95% of all BPPV cases are the result of otoconia being trapped in the posterior SCC (PSC) and that 10–12% of cases are the result of otoconia trapped in the horizontal SCC (HSC)2, 3). There is much more debate concerning the anterior SCC (ASC), and reports vary from 2–21% of cases2). Symptoms of BPPV include brief attacks of dizziness or vertigo associated with nystagmus, blurred vision, light-headedness, loss of balance, and nausea that are triggered by angular position changes such as bending forward, sitting up, and rolling over in bed2, 3). The symptoms can last for days, weeks or months or can be recurrent over many years. In around half of BPPV cases, no cause can be found (idiopathic BPPV). However, in older people, the most common cause is degeneration of the gelatinous matrix within the utricle supporting the otoconia2, 4).

The diagnosis of BPPV is relatively straightforward due to the characteristic history and positional vertigo, which can be induced using the Hallpike-Dix maneuver5). The addition of using infrared goggles with the Hallpike-Dix maneuver improves the accuracy of the test. During the Hallpike-Dix maneuver, the patient long-sits on an examination table with their head rotated approximately 45 degrees to one side. The clinician then assists the patient into a supine position with their head and neck extended slightly below the level of the table while maintaining the rotated head position2, 8, 9). The symptoms typically begin a few seconds after assuming this position. This is due to the gravitational impact of the test position, which moves the otoconia within the SCCs. This increases the internal pull on the endolymphatic fluid of the SCC, producing a more vigorous bending of the cilia within the ampulla of the SCC5). The end result of the Hallpike-Dix maneuver, in the presence of BPPV, is vertical-torsional jerk nystagmus of typically short duration, suggesting a specific type of BPPV called canalithiasis. In this research study, we have operationally defined BPPV as the canalithiasis form. The clinician can determine the SCC involved by analyzing the eye movements provoked and the latency of the nystagmus5). ASC BPPV is characterized by paroxysmal down-beating nystagmus lasting less than 60 seconds10, 11). The most common clinical intervention for canalithiasis of the ASC is the canalith-repositioning maneuver (CRM). However, recent literature suggests using the DH maneuver, as illustrated by Yacovino et al., as the primary treatment...
for ASC BPPV\textsuperscript{13}. The DH maneuver is performed on an examination table in a similar manner to the CRM. Because the ASC has a different trajectory from the PSC, maneuvers targeting ASC BPPV differ geometrically from those described by Epley for PSC BPPV\textsuperscript{12}. The idea of the DH maneuver is to invert the ASC to allow debris to fall to the "top" of the ASC, and then, upon returning the patient to the sitting position, allow it to migrate further into the common crus and then the utricle\textsuperscript{10}. The purpose of the current investigation was to determine whether the DH maneuver is an efficacious treatment maneuver for ASC BPPV.

**SUBJECTS AND METHODS**

All twenty-two adult patients were recruited from patients seen at King Abdulaziz University Hospital. Informed consent was acquired prior to the beginning of the study. Age ranged from 41–63 years with an average age of 53 years. Ten patients were male, and twelve were female. ASC BPPV was confirmed in all patients with video-nystagmography recording (VNG) after it was determined that there was no central-mediated problem. Patients were treated with the DH maneuver as illustrated by Yacovino et al.\textsuperscript{13}. This treatment consisted of four steps with intervals of at least thirty seconds. In the method of Yacovino et al., the patient is first assisted from a sitting position into a supine position with their head extended backwards by 30°. This position is maintained while their head is flexed forward 45°. Finally, the patient is returned to the sitting position. In position 1, the otoconia lie near the ASC ampulla. In position 2 (head-hanging position), both ASC’s are inverted with their ampullae superior and their non-ampullary endings medial and inferior. Otoconia migrate due to their weight towards the apex of the ASC. In position 3 (chin to chest), gravity facilitates further migration towards the common crus. Finally, in position 4, the patient sits up with the head tucked in. This last step allows the otoconia to move through the common crus and into the utricle.

In this study, the first author, who is experienced in the treatment of ASC BPPV using the DH maneuver, conducted all treatment sessions. All patients received one DH maneuver treatment per appointment and returned for follow-up evaluation at one-week intervals. Patients were judged to be “clear” of the ASC BPPV when there was no nystagmus or subjective vertigo elicited by diagnostic positioning at a follow-up appointment. This study method was supported by other research using the same method\textsuperscript{10}.

**RESULTS**

The results showed that 77.3% of the twenty-two patients were clear of ASC BPPV after one DH treatment session, with another 18.1% clear after a second treatment session. The remaining 4.5% required a third treatment session. All patients were cleared within three treatment sessions. On average, 1.27 treatments were required to clear the 22 patients. The average age of the patients cleared in one treatment session was 57 years; the corresponding figure was 53 years for patients requiring two to three treatment sessions. These results suggest no apparent effect of age in determining outcome efficacy. The patients included in the study were telephoned one month following initial clearance by the DH maneuver, and all reported 100% resolution of all symptoms.

**DISCUSSION**

The mechanism driving BPPV is otoconia pathologically located in one of the three SCCs of the inner ear. Because otoconia have mass, angular position changes affect the involved SCC as the otoconia move within the endolymphatic fluid\textsuperscript{2}. This movement results in an increased neural firing rate of the involved inner ear and a sensory mismatch between the systems responsible for position sense and balance\textsuperscript{2, 14}. The symptomatic consequences include nausea and vertigo lasting from seconds to minutes\textsuperscript{1, 2}. Medical management aimed at resolving BPPV includes the CRM and/or liberatory maneuvers depending upon the specific BPPV type\textsuperscript{1, 2}. The purpose of the current investigation was to determine whether the DH maneuver is an efficacious treatment maneuver for ASC BPPV. The results from the current study indicated that the DH maneuver was successful in clearing ASC BPPV. The purpose of the DH maneuver was to remove physically the otoconia from the SCC and relocate them back into the utricle using gravity and a systematic progression of head position changes\textsuperscript{3, 10}. Approximately 95% of patients were clear within one or two treatments, and less than 5% of the patients required a third treatment session. This phenomenon is likely to have been due to some difficulties in maintaining each position for at least 30 seconds until the symptoms and nystagmus had disappeared due to the severity of symptoms. This compares well with data reported in previous studies of treatment maneuvers for ASC BPPV using the DH maneuver as the primary treatment for ASC BPPV. Yacovino et al. (2009) reported that all cases showed excellent therapeutic response to the DH maneuver\textsuperscript{13}. Kim et al. (2005) reported that vertigo and nystagmus in 29 patients were fully resolved using this maneuver and that 96.7% of patients became symptom free\textsuperscript{10}. Based on these findings and our results, the DH maneuver could be one of the most effective treatment methods for ASC BPPV. The DH maneuver has the advantage that the clinician does not need to know the affected side\textsuperscript{10}. The ASC is much nearer to the sagittal plane than the PSC, so keeping the head in a neutral non-rotated position is more beneficial in mobilizing the particles in the ASC compared with rotatory movements\textsuperscript{15}. There are two major limitations in this study: the difficulty in recruiting patients with ASC BPPV because of the rarity of the condition, and the fact that we did not use comprehensive outcome measures but instead depended on our knowledge and skills to accurately interpret VNG findings from one treatment session to another for each patient. However, a future study would be improved by including a control group, and will require specific subjective measures such as the Dizziness Handicap Inventory (DHI) and highly valid and reliable objective measures such as electronystagmogram (ENG) in order to strengthen the analysis and findings. Based upon the results
of the current study, the DH maneuver was demonstrated to be a useful treatment in patients presenting with possible ASC BPPV. Moreover, the results from the current study indicate that approximately 95% of the patients were clear after one or two DH maneuvers.

REFERENCES


