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Application of Deep Head Suspension in Physical Therapy to Manage Patients with Anterior Calculi

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Abstract

A 61-year-old patient presented with a sudden onset of chronic dizziness 4 months ago. His symptoms included intermittent nausea and dizziness. The left Hallpike-Dix test causes the patient to feel dizzy and nauseous. Weak left torsion nystagmus lasting about 10 s was also observed. The right head suspension (HH) test was then performed and it produced some strong left torsion nystagmus lasting about 30 s. The patient was diagnosed with left anterior renal tubular stone disease, which is a type of benign paroxysmal postural vertigo (BPPV). Deep head suspension (DHM) was performed and the patient reported feeling better soon after. The HH test was repeated within minutes and the patient reported 80% relief of dizziness and nausea. The patient was seen the next day and reported 100% resolution of symptoms. Her symptoms still resolved after a week of follow-up. Based on the limited research on the testing and intervention methods described in this single-topic case report, further research, including controlled clinical trials, is warranted.

Keywords: Vestibular rehabilitation; Mild paroxysmal orthostatic vertigo

Introduction

Benign paroxysmal postural vertigo (BPPV) is one of the most frequently diagnosed diagnoses in ENT and primary care clinics. In the labyrinth of the inner ear is a collection of calcium crystals known as otoconia. For a variety of reasons, in patients with BPPV, otoconias are dislodged from their usual location in the alimentary canal and migrate through the intraocular fluid into one of the three semicircular canals (SCCs) of the inner ear. After changing the angular position, the involved SCC sends incorrect signals to the brain indicating that the stationary head is still in motion. It has been reported that 80-90% of all cases of BPPV are the result of occlusion of the ear canal in posterior SCC (PSC) and 10-12% in transverse SCC (HSC) . There is more debate about anterior SCC (ASC) and reports range from 2-21%. Symptoms of BPPV include brief bouts of vertigo (vertigo) associated with nystagmus, lightheadedness, dizziness, and nausea caused by changes in angular position such as leaning forward, sitting up, and rolling over. in bed [1]. These symptoms can last from a few days to a few months and can recur for years. BPPV is often idiopathic; However, in the elderly, the most common cause is degeneration of the colloidal matrix in the tympanic tube that supports the ear canal. Diagnosis of BPPV is based on a characteristic history including orthostatic dizziness that can be caused by the Hallpike-Dix test. Adding the use of infrared glasses with the Hallpike-Dix test improves the accuracy of the test. During the Hallpike-Dix examination, the patient sits for a long time on the examination table with the head turned about 45 degrees to the side. The clinician then positions the patient in a supine position with the head and neck slightly extended below the tabletop while keeping the head turned. Symptoms usually begin within seconds of taking up this position due to the gravitational force that moves the otoconia into the SCC. This increases the traction within the intralymphatic fluid of the SCC, creating stronger flexing cilia inside the SCC ball. The end result of the Hallpike-Dix test, in the presence of BPPV, is short-lived vertical torsion nystagmus (anterior and posterior SCC) often suggestive of a specific type of BPPV known as BPPV renal tubular stones. The clinician can determine the relevant SCC by observing the direction of eye movement. ASC tubal stones are characterized by paroxysmal nystagmus lasting less than 60 seconds. The most common clinical intervention for tubular stones is the canal repositioning procedure (CRM), also known as the Epley procedure. CRM is considered the mainstay of treatment for SCC longitudinal stones [2].

Although the effectiveness of CRM on PSC duct stones has been well established in the literature, this is not the case with ASC duct stones. Yacovino et al. proposed using deep head suspension (DHM) as the primary treatment for ASC tubal calculi. DHM is performed on an examination table like a CRM. Because ASCs have a different trajectory than CSPs, manipulations targeting ASC calculi are geometrically different from those described by Epley for PSC calculi. The DHM aims to reverse the ASC and allow debris to fall to the 'top' of the ASC and then, once in place, allow it to move deeper into the community and then into the drain. The DHM has the advantage that the clinician does not need to know the affected party. According to Casani et al., the ASC is much closer to the longitudinal plane than the PSC, so keeping the tip in a neutral position without rotation is more beneficial for the mobilization of particles in the ASC than rotational movements argues that turning the head 45 degrees to the side, as in CRM, can prevent the number of position-dependent positions required to successfully move the otoconia through the ASC [3]. The purpose of this case report is to provide anecdotal evidence of successful resolution of ASC tubular calculi with DHM.

Case summary

A 61-year-old primary school teacher from Saudi Arabia presented with a primary complaint of sudden chronic vertigo that began 4 months ago. Symptoms include position-related nausea and dizziness. She was referred by an ENT specialist with a diagnosis of orthostatic

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vertigo. The patient denied a previous diagnosis of orthostatic vertigo or any recent history of trauma or infection that may have predisposed her to develop orthostatic vertigo. Her family and social history is unremarkable and she states that she does not take any medications. Subjective examination revealed persistent position-induced dizziness lasting 20 to 30 seconds after a sudden change in angle and nausea. The main provocative positional changes are head/neck rotation to the right and head/neck extension. The physical examination includes screening tests for cervical instability, cervical position tolerance, and video ophthalmoscopy (VNG). VNG provides an objective assessment of the oculomotor and vestibular systems and helps determine central versus peripheral involvement. After determining that there were no mediating problems, cervical instability, or cervical position intolerance, a suitable Hallpike-Dix test was performed using VNG and the results were negative. The patient was returned to a prolonged sitting position and after a brief rest, a left Hallpike-Dix test was performed. This test produced dizziness and nausea in the patient and observed weak left-to-side nystagmus lasting approximately 10 seconds. At this time, the right head test (HH) was performed to determine ASC involvement [4]. During HH examination, the patient remains seated for a long time on the examination table, with the head in a neutral position. The clinician then positions the patient in a supine position with their head extended as far as possible so that their head hangs over the edge at a 30-degree angle to the horizontal. The patient is asked to look straight ahead and the doctor checks for nystagmus. In the present case, the HH test produced several episodes of intense left torsion nystagmus lasting approximately 30 seconds. The patient was diagnosed with left ASC nephrolithiasis. A CRM was performed and the patient was returned to a sitting position. The patient consented to a second HH test within minutes, which again caused nausea, dizziness, and the pulsating heartbeat of left torsion nystagmus lasting about 30 seconds. At this point, the decision to implement the DHM has been made. The patient reported that she felt better immediately after the DHM [5-7]. The HH test was completed within minutes and the patient reported that her dizziness and nausea resolved 80% during and shortly after the test was completed. Patients were instructed to minimize head tilt movements, to avoid sleeping on their sides, and to use an extra pillow for a slightly elevated position that night. Her next exam was scheduled for the next day. The patient returned the next day and reported that she was 100% free of dizziness and nausea. The HH test was negative because no nystagmus was observed and there were no reports of dizziness or nausea. The patient returned for a third appointment a week later and continued to report 100% resolution of all symptoms. The patient was discharged at this point and instructed to return to the clinic if she relapsed of symptoms. No other home interventions were performed. This outcome for the patient was expected based on the outcome of the assessment and there were no unintended effects of patient management.

Discussion

The mechanism that causes BPPV is pathological otoconia located in one of the three SCCs of the inner ear. Because otoconia has mass, changes in angular position affect the associated SCC as the otoconia moves through the endolymph fluid [8-12]. This movement leads to an increased rate of nerve activation of the involved inner ear and a sensory mismatch between the systems responsible for the sense of position and balance. Symptomatic consequences include nausea and dizziness lasting from seconds to minutes. Medical management aimed at addressing BPPV includes CRM or release manipulation depending on the specific type of BPPV. The goal of these procedures is to physically remove the otoconia from the SCC and replace it in the utricle using gravity through a systematic head displacement process.

The DHM consists of 4 steps spaced at least 30 seconds apart. The patient is supported from a prolonged sitting position to a lying position with the head tilted back 30 degrees. Then, the prone position is maintained while the head is bent forward 45 degrees relative to the horizontal plane. Finally, the patient is returned to a sitting position. In position 1, the otoconia is located near the ASC ball. In position 2 (tilt head position), the two ASCs are inverted with their upper and lower tubeless ends. Otoconias move due to their weight with respect to the top of the ASC. In position 3 (chin to chest), gravity facilitates further migration to crus common. Finally, in position 4, the patient sat with his head supine. This final step allows the otoconia to migrate through the common cortex and into the urinary foramen.

Conclusion

In this case report, we described the clinical management of a patient with ASC tubal calculi. HH testing is performed to establish the clinical diagnosis, and DHM is used to successfully treat the patient's condition. Based on the limited research on the testing and intervention methods described in this single-topic case report, further research, including controlled clinical trials, is warranted.

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