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The Dix-Hallpike Test and The Canalith Repositioning Maneuver

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The Dix-Hallpike test and the canalith repositioning maneuver (CRM) are used to diagnose and treat benign positional vertigo (BPV). Dix-Hallpike is the standard procedure for diagnosis of BPV, but if the horizontal canal is not tested for BPV and the Dix-Hallpike is only carried out once, the condition may not be diagnosed and appropriately treated. We describe our method of testing for BPV and treating it with CRM. The Dix-Hallpike test involves rapidly moving the patient from a sitting position to "head hanging," where the patient's head is at least 10 degrees below horizontal. This is performed initially for the posterior semicircular canals. If these movements fail to elicit vertigo and nystagmus, tests of the horizontal semicircular canals are performed by laying the patient on each side. Importantly, if there is no vertigo or nystagmus elicited by testing the horizontal semi-circular canals, the posterior semicircular canals are tested again. It appears that being held in the head hanging positions and then left and right lateral positions will often allow the canaliths to collect such that the Dix-Hallpike test will become positive. Failure to repeat the tests of the posterior semicircular canals may result in a falsely negative test. Testing the horizontal canals and repeating the Dix-Hallpike test will reduce the likelihood of patients undergoing extra testing or other consequences of misdiagnosis. If, during any of this testing, a movement elicits vertigo or nystagmus, the appropriate CRM is then carried out. *Key Words:* Benign positional vertigo, Dix-Hallpike test, canalith repositioning maneuver.
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INTRODUCTION

The Dix-Hallpike Test is used to diagnose benign positional vertigo (BPV). If the test is positive, a canalith repositioning maneuver (CRM) is then used to treat BPV. Beyond the originally described test by Dix and Hallpike[1] and CRM by Epley,[2] we have incorporated a number of modifications that we feel improve the diagnosis and treatment of BPV. For example, we advocate repeating the Dix-Hallpike test after the patient lies supine if the initial test fails to produce nystagmus. A repeat test often will produce nystagmus and vertigo and confirm the diagnosis of BPV. Our experience suggests that in patients with a history suggesting active BPV, the repeat test confirms the diagnosis approximately 10% to 20% of the time. Haynes et al.[3] recently recommended performing CRMs even if the Dix-Hallpike test does not show nystagmus. However, it is always preferable to identify the characteristic nystagmus so that the diagnosis is confirmed.

PERFORMING THE DIX-HALLPIKE TEST

A clear description of the test, including the likelihood of inducing vertigo, should be given to the patient. Many patients are apprehensive, and a few will develop a panic reaction. They should be reassured that they will be held securely and that the vertigo will be transient. If the patient is markedly concerned, a mild sedative such as diazepam in a dose of 2 to 5 mg can be given orally or intramuscularly 30 minutes before the test. However, medication is typically not necessary.

We first test the side that, by history, did not provoke vertigo. For example, if the patient states that rolling to the right provokes symptoms, the left side is tested first. In addition to proving that the vertigo only occurs on one side, testing the good ear first demonstrates to the patient how the test is performed. Patients are often stiff in anticipation of provocation of their vertigo, and they may resist the backward movement. Showing the patient the movement and demonstrating that they will be held securely helps obtain a swifter motion for the likely affected side. Also, by doing the affected side last, one can proceed directly into the CRM, minimizing the attacks of induced vertigo. If the patient is not sure which side triggers vertigo, we have them guess the likely side.

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To begin the test, the patient should be seated upright with the head held by the examiner while the patient holds the examiner's arm for support. Figure 1 illustrates our version of the Dix-Hallpike test and the CRM for left-sided posterior semicircular canal BPV. Frenzel's glasses or video goggles can be used but are certainly not necessary. The head is turned 45 degrees toward the side being tested. The patient is reminded to keep the eyes open because it is critical that the examiner see the eyes when the vertigo occurs. While supporting the head, the examiner rapidly places the patient's head into a hanging position below the level of the examining table. Typically, there are a few seconds of latency before a burst of torsional-vertical nystagmus occurs. The upper poles of the eyes beat torsionally toward the ground. This stereotypical nystagmus rarely lasts longer than 20 seconds and is pathognomonic of the posterior canal variant of BPV. There are central causes of paroxysmal positional nystagmus, but typically there is no latency to onset, the nystagmus is purely vertical (usually down beat), and there are nearly always other associated neurologic symptoms and signs in these rare cases.

PERFORMING THE CRM

If the typical positioning nystagmus is induced, we proceed with the CRM to remove the debris from the canal. After the nystagmus and vertigo subside, the patient is rotated 225 degrees across to the other side, ending on the opposite shoulder with the nose pointing down toward the ground (Fig. 1). This 225 degree roll is approx-

Fig. 1. Dix-Hallpike test for left posterior semicircular canal benign positional vertigo (BPV) (panels 1 and 2). In this patient, the test was positive, and the canalith-repositioning maneuver for treatment of left posterior semicircular canal BPV was immediately performed (panels 3 to 5). See text for detailed description of the Dix-Hallpike test and canalith repositioning maneuvers.

imately in the plane of the posterior semicircular canal and causes the debris to roll around the canal into the common crus of the posterior and anterior canals.

It is critical that the patient's head stay below the horizontal plane during the roll across to the other side, or the debris may move back toward the cupula. In our experience, lifting the head during this turn of the CRM is the most common reason for a failed maneuver. After reaching the nose down position, if the patient develops a second burst of nystagmus identical in direction to the first, it is a good indication that the CRM will be successful because debris has moved in the correct direction. However, absence of a second burst of nystagmus does not mean that the CRM will fail.

When the patient is returned to the sitting position, it is important to immediately provide strong support to the patient for a minute or two because they may experience a vigorous attack of vertigo. This vertigo after sitting upright results from canalith debris dropping into the utricle from the common crus of the posterior and anterior canals. Care is needed to prevent the patient from falling if this occurs. After a suitable rest, the Dix-Hallpike test and the CRM are repeated until no nystagmus or vertigo is induced. Generally, no more that three or four attempts are made in one session because numerous maneuvers will provoke severe motion sickness.

If, after the position change, the nystagmus is slow to onset and persists at a low frequency, the canalith debris may be stuck to the wall of the canal or attached to the cupula. In this case, vibration applied to the mastoid on the affected side can help dislodge the debris, allowing it move around the canal.

HORIZONTAL CANAL BPV

If the Dix-Hallpike test is negative on both sides, we immediately proceed to a test for the horizontal canal variant of BPV. The horizontal canal variant of BPV is relatively rare with respect to posterior canal type (less

Fig. 2. Test for horizontal semicircular canal benign positional vertigo (BPV) (upper panels). The patient begins in a supine position and is then turned to the right, back to the supine, and then to the left. The side with the strongest nystagmus is the abnormal side. Treatment maneuver for right-sided horizontal semicircular canal BPV (lower panels). The patient is rotated "barbecue spit" fashion toward the normal ear (in this case to the left) through 360 degrees. The patient is rotated in the opposite direction for left-sided horizontal canal BPV.

than 1% in our experience). With the patient placed supine (Fig. 2), the head and body are rotated 90 degrees laterally, while reminding the patient to keep the eyes open. We look for a burst of horizontal nystagmus beating toward the ground. The nystagmus can last as long as 30 to 60 seconds; the affected side has the stronger nystagmus. If there is no vertigo or nystagmus after 30 seconds in each lateral position, the test is deemed negative.

For treatment of the horizontal canal BPV, beginning with the supine position, the patient is rolled toward the normal side (barbecue-spit fashion) keeping the head in line with the long axis of the body.[4] The procedure is best performed on a floor mat (or carpet) that allows a complete 360 degree rotation back to the supine position without stopping. Vibration over the mastoid on the affected side is particularly helpful for horizontal canal CRM.

REPEATING THE DIX-HALLPIKE TEST

If the horizontal canal BPV test is negative, we then repeat the Dix-Hallpike test. We have often found that typical BPV nystagmus will be seen on the repeat test even though the original test was negative in 10% to 20% of cases where the history was consistent with BPV. Presumably, the brief period of lying supine allows the debris that was dispersed throughout the posterior canal to form a clot that is more effective in displacing the cupula. Regardless of the mechanism, this simple procedure of repeating the Dix-Hallpike test after the horizontal test has increased the number of positive tests.

ANTERIOR CANAL BPV

In approximately 1% to 2% of cases with a history consistent with BPV, during the Dix-Hallpike test, nystagmus can be seen with downbeat and torsional component, indicating the anterior canal variant of the condition. For example, with the right ear down, the nystagmus appears with quick phases in the clockwise and downbeat directions. This nystagmus pattern indicates BPV in the right anterior canal. The treatment for right anterior canal BPV is CRM as though it was for left posterior canal BPV, as shown in Figure 1.[5]

INSTRUCTIONS TO THE PATIENT

For the usual posterior canal variant of BPV, once the debris has entered the utricle, the only way it can reenter the posterior canal is if the head is held far back for a prolonged period of time. The most common circumstances where this occurs is at the hairdressers (when washing the hair), at the dentists or doctor's office (undergoing some procedure), or while exercising (e.g., yoga). We instruct the patient to always avoid these provocative extreme head-back positions. However, we do not necessarily instruct them to change their sleeping patterns or avoid any other type of head or neck movement. We indicate that there is at least a 50% change of recurrence at some time in the future and provide the patient with detailed instructions on how to perform the CRM on their own should there be a recurrence.

For the horizontal canal variant of BPV, we instruct the patient to sleep over night with the normal ear (side with least nystagmus) down because this will cause any remaining debris to fall from the canal into the utricle. If BPV recurs, they are instructed to sleep in this position until it again disappears.

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