

Vestibular Update becomes modernized with this issue, the first issue to be released in CD-ROM format. The CD-ROM contains over 30 minutes of instructional video clips on what Benign Paroxysmal Positioning Vertigo is, how it is diagnosed, and ways to treat it. Below is the article reprinted without the video clips.

If you would like to obtain a copy of Vestibular Update Issue 26 on CD, [subscribe to the newsletter](#) or call Micromedical Technologies at 800.334.4154 (U.S. & Canada) or 217.483.2122 (Outside U.S.)

## **Benign Paroxysmal Positional Vertigo Diagnosis and Treatment**

By

Marian Girardi, MA  
Mary Neill, MA, CCC-A

### ***Background***

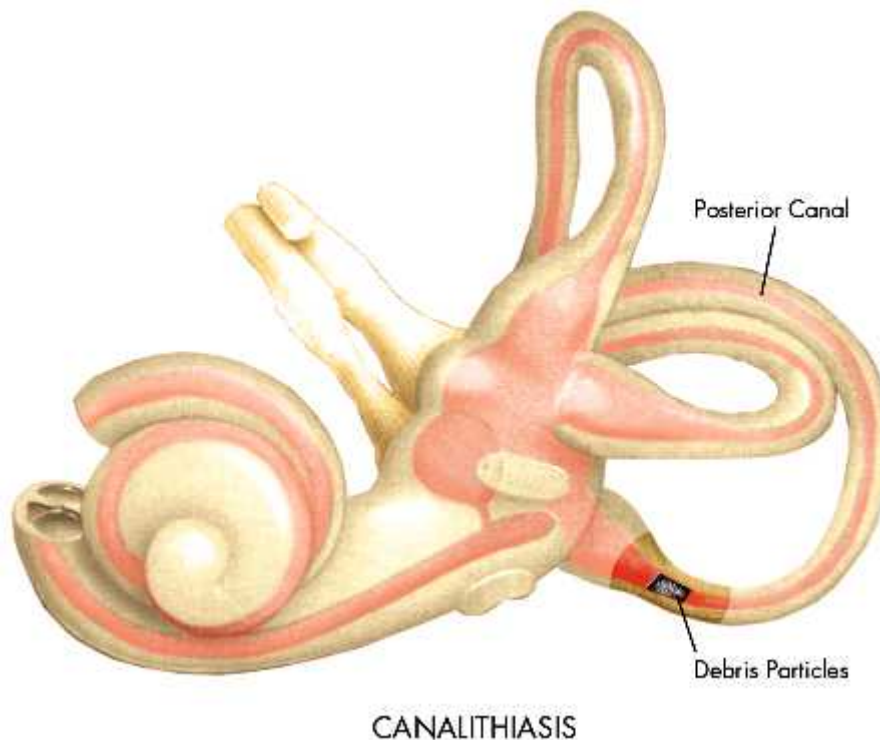
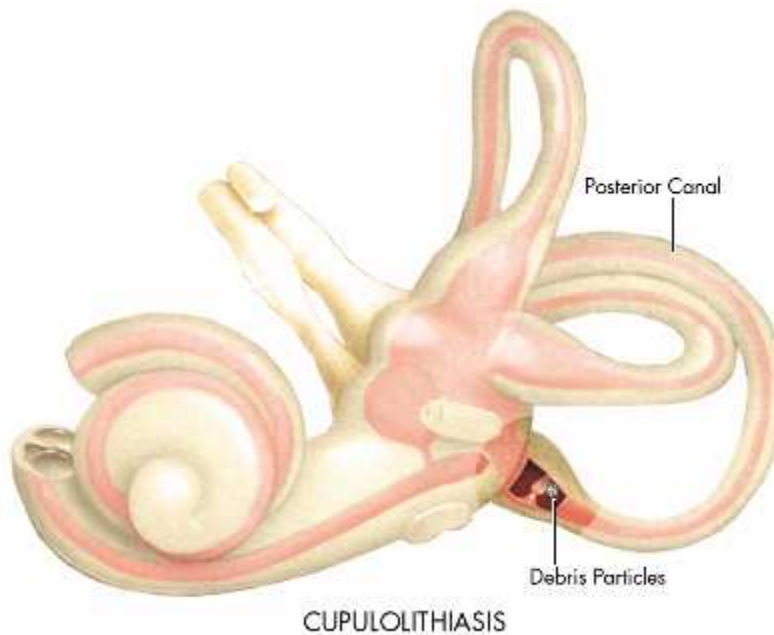
First described by Barany in 1921, Benign Paroxysmal Positional Vertigo (BPPV) is the most common peripheral vestibular disorder.<sup>1</sup> A recent study reports the incidence as high as 600 cases/100,000 population with over 50% of all cases being idiopathic in origin.<sup>2</sup> However, BPPV can also commonly be seen following labyrinthitis, head trauma or even a Meniere's episode. Most patients with this disorder complain of episodic vertigo, usually provoked by head movements when the affected canal is moved in the plane of gravity. While this vestibular dysfunction can be seen in individuals of any age, it is very seldom seen in children, but becomes increasingly more prevalent in middle-aged and elderly populations.

BPPV is characterized by complaints of brief periodic vertigo provoked by head movement. Diagnosis is made by patient history and by clinical findings that entail provoking the vertigo symptoms and observing the characteristic nystagmus accompanying the vertigo. The classical nystagmus (torsional and geotropic for the posterior and anterior canals) is produced in response to otoconial debris being dislocated in the semi-circular canal when the head is moved.

The Dix-Hallpike test is utilized to elicit this classic nystagmus. In the past, it was more difficult to differentiate the various types of nystagmus using just direct observation of the eyes or even Frenzel glasses. Frequently the nystagmus had disappeared before it could thoroughly be examined and classified. Also, the examiner would find it difficult to position him/herself in such a way to observe the eyes of the patient. For many patients experiencing vertigo symptoms, an attempt is made to escape from these spinning sensations by squeezing their eyes tightly shut, thereby not allowing the examiner to visualize any eye movements. With the advent of IR video goggles, the patient remains subjectively in darkness and has less difficulty in keeping their eyes open. Most often the nystagmus fatigues in less than 10-20 seconds. By utilizing the recording function of the IR goggles, videotape of the abnormal eye movements can be made by the examiner. This allows for a closer and more thorough examination at a later viewing, thereby aiding in the diagnosis of the correct canal involvement, allowing for the proper treatment therapy.<sup>6</sup>

### ***Etiology***

There are two commonly accepted etiologies for the cause of BPPV, both of which involve a movement of the otolithic particles from the maculae of the utricle into one of the semi-circular canals. For cupulolithiasis, it is believed these particles actually attach to the cupula, making the ampulla gravity sensitive. The increased density of the attachment of these particles to the cupula produces excessive deflection when the patient's head is moved, bringing about the symptoms. The theory of canalithiasis, which is now believed to be by far the most common, proposes that the debris is free-floating in the canal and when the head is moved in relation to gravity, the clump of particles moves, causing a deflection of the cupula. The cupular movement brings on the symptoms of vertigo and nystagmus.<sup>3</sup>



While any of the three canals can be involved, the posterior canal is by far the most prevalent site for the disorder. Treatment for these various types of BPPV differs, and diagnosis for each specific variant is made by closely observing the nystagmus, a task much simplified with the use of infrared (IR) goggles.<sup>4</sup> Several other medical conditions, including positioning vertigo of either central or peripheral origin, vertebro-basilar insufficiency (VBI), and intercranial neoplasm may not only mimic BPPV, but can be misdiagnosed as a BPPV variant.

### ***Dix-Hallpike Test***

By utilizing the IR video goggles during Dix-Hallpike testing, the examiner may make a more accurate diagnosis by recording the patients' eyes for a more thorough visualization and examination of the nystagmus. A complete patient history can aid in ruling out other possible diagnoses of a systemic origin, as well.

Complete ENG testing helps us rule out other causes for your dizziness. Your symptoms can come not only from your inner ear, but also from certain parts of your brain. When you lie down with your head back and get dizzy, if we

see the nystagmus eye movement, we can be pretty certain that BPPV is your problem. BPPV is caused by little crystals, "ear rocks", in the inner ear getting dislodged from the area where they're supposed to be (as part of the gravity-sensing organ called the utricle). They get moved into one of the three semi-circular canals and when you move your head, they move around in the canal making you feel dizzy. While you feel like you're spinning, we can see specific eye movements, called nystagmus, which help us diagnose your problem. The good news for you is that BPPV is the most highly and effectively treatable cause for dizziness.<sup>7</sup>

To diagnose posterior and anterior canal BPPV, the classic Dix-Hallpike test is utilized. While seated and wearing infrared goggles, the patient's head is turned 30-45 degrees to the left then to the right. The TV monitor is examined for nystagmus and the patient is questioned about symptoms. A very brief VOR nystagmus is generated when the patient's head is turned however, if considerable nystagmus or vertigo is produced at this point, the cause is NOT BPPV, and the testing is discontinued. Some other reason than BPPV caused the symptoms, the canals were never moved in the plane of gravity. If the head turn gives negative results, the patient is moved to the supine position. The head is extended backward 30 degrees below the level of the supporting table. With BPPV, nystagmus and vertigo begin within 60 seconds of the patient having been placed in the provoking position. With the affected ear down, the nystagmus is torsional and geotropic with an up-beating component for the posterior canal and a down-beating component for the anterior canal.<sup>5,6</sup>



### ***Particle Repositioning Maneuver (PRM) for left Posterior Canal / Anterior Canal BPPV Explained to Clinician***

While many single and multiple-treatment therapies have been proposed for the management of posterior/anterior canal BPPV, the most commonly used in most clinics is a version of the Particle Repositioning Maneuver (PRM), also known as the Canalith Repositioning Therapy (CRT). The patient is placed in the provoking D-H position. A geotropic, torsional nystagmus is seen accompanied by vertigo. The patient is kept in this position for an additional three minutes. Her head is then slowly rotated to the right D-H position. If a nystagmus is seen (may or may not), it should be the same as the original nystagmus. She is kept here 3 minutes. She is then asked to move her left arm over her body while bending her left leg at the knee to assist in moving her onto her right shoulder, head facing down. Again, if nystagmus is seen, it should be the same as the original. She is kept here one minute. She is then asked to aid us in assisting her to sitting. If nystagmus and/or vertigo (NOT lightheadedness) is elicited here, the entire process is repeated until we get her sitting up asymptomatic. She is given the collar and instructed on no head movements.<sup>6</sup>

### ***Explained to patient***

The "ear rocks", I described earlier, have become dislocated from the spot where they are normally supposed to be and are now causing you dizziness. Since they are in the wrong part of the inner ear, we're going to perform a treatment to move them out of the canals and into the "vestibule" of the inner ear where specialized enzymatic cells, called "dark cells" can digest them so you won't have any more problems. By watching your eyes, we can see how these crystals are moving in your inner ear, so you will need to wear the IR goggles again.

After the treatment is performed, you'll need to keep your head still for the next 48 hours so the crystals don't get shaken up and cause more dizziness. You will be provided with a soft cervical (whiplash) collar to help aid you in not moving your head. Drink from a straw. Have someone drive you home. Also, you may not lie flat to sleep for the next two nights, so plan on sleeping either in a recliner chair or with a pile of pillows. Try not to lie on the affected side for

the next 5 nights, if possible. We'll see you back here in the clinic in one to two weeks to make sure the therapy worked for you. If not, we may do another treatment then, but we can discuss the options at that time.<sup>7</sup>

### **Written Patient Take Home Instructions after Maneuver<sup>7</sup>**

- Have someone drive you home
- For the next two nights sleep at about a 45 degree angle in a recliner or on several pillows
- During the day keep your head vertical. Drink from a straw. Avoid exercises that require head movement. Do not go to dentist or hairdresser.
- Avoid provoking head positions for at least one week. Try not to sleep on affected side.

### **Follow-up**

#### ***Patient symptom free with Brandt-Daroff exercises***

When our patients return 7-14 days following a single-treatment maneuver, another Dix-Hallpike test is performed, again utilizing IR goggles. If no nystagmus is visualized and no vertigo elicited, then a successful treatment has been performed. A study which our lab did showed that daily performance of the Brandt-Daroff exercise following a successful single treatment maneuver was highly efficacious in the prevention of further BPPV episodes.<sup>12</sup> We therefore instruct all our patients to perform the Brandt-Daroff exercises three times each direction (alternating sides) daily.

The patients are instructed as follows. While sitting on the edge of your bed, with your feet hanging off the side, look straight ahead. Tilt your head so your nose is pointed up to the left corner of the room. Rapidly fall onto your right shoulder. If you feel dizzy, stay down until the symptoms pass. If not, wait 10 seconds. Then rapidly sit up. Again wait until any dizziness passes or 10 seconds, then do the same exercise falling to the left. Repeat three times each direction. If you are dizzy more than three days in a row, or if your positionally provoked symptoms return with any severity or frequency more than three days, call the clinic for another appointment.

While these same Brandt-Daroff exercises have been shown to be successful as a therapy for BPPV symptoms, we do not usually recommend them for most patients as a primary treatment. The exercises require the patient to provoke their symptoms until fatigued many times per day, and we find the compliance rate to be very low for this reason. However, if several single-treatment therapies have not been successful, we may recommend this treatment modality. Also, as mentioned, we have found it to be a highly successful method for preventing BPPV symptom recurrence.

#### ***Patient Follow-up with symptoms***

If the problem is thought to be cupulolithiasis rather than canalithiasis from the initial Dix-Hallpike testing, mastoid oscillation is used. It is believed this vibration can better "break up" the clump of otoconial debris attached to the cupula. Also, if the PRM is not successful the first and/or second times, mastoid oscillation can be added. The PRM is performed in the standard fashion as previously described, with some form of oscillating source over the mastoid process.<sup>11</sup> There are head-band type oscillators as well as the Swedish massage type which strap onto the back of the therapist's hand, causing the fingers to be the oscillating tool. We find that patients become more nauseated with oscillations, as well as it limiting the video of the nystagmus. Also, some clinics have warned of possible retinal detachment from too pronounced a vibratory source.

#### ***Semont Liberatory Maneuver***

The "Liberatory maneuver", developed by Semont et al is most commonly used in the U.S. for the cupulolithiasis variant of PC/AC BPPV. This treatment begins with the patient sitting on the exam table with the head turned 45 degrees opposite the affected ear. He/she is then very quickly moved to the provoking position with head hanging down. Following 5 minutes in this position, the patient is very rapidly maneuvered to the opposite, nose down position. The therapist carefully catches the patient head with his/her forearms on the table. This position is maintained for 3 minutes more. The patient is then given a soft cervical collar and the same instructions about limiting head movements.<sup>10</sup>

#### ***Horizontal Canal BPPV***

If a horizontally beating nystagmus (instead of the torsional nystagmus described above) is seen during Dix-Hallpike testing, the patient should then be tested with a roll maneuver. For this test the patient should be lying supine with the head slightly elevated. The head is then quickly moved to each of the ear down positions, while observing for a horizontal nystagmus. It is not uncommon for each ear down to show horizontal nystagmus, but generally, the affected ear produces a nystagmus which beats geotropically and stronger than the non-affected ear.

A geotropic horizontal nystagmus accompanied by vertigo with the affected ear down indicates the horizontal canal

BPPV variant. The treatment for the horizontal canal is somewhat different than the therapy for the posterior/anterior canal involvements.<sup>8</sup> The two clips below illustrate left-beating horizontal nystagmus. This nystagmus is typical with left horizontal canal BPPV when the left ear is down.

## **Canal Repositioning maneuver for horizontal canal BPPV**

For the patient with a horizontal canal variant of BPPV, the treatment is somewhat different. The therapy is done with the patient in the supine position, head flat or even slightly elevated. Again, IR goggles are used to watch and record nystagmus. The first position is with the affected ear down. After one minute in this position, the head is moved so the nose is pointing up, where it remains for one minute. Then the head is moved to the affected ear up position for one minute. For this next movement, an assistant may be needed. While the therapist is supporting the patient's head, affected ear up, the patient moves into a prone position. The head is then moved into a nose-down position for one minute. Then the head is rotated another 90 degrees, to the affected ear down position for one minute. With the therapist again supporting the patient's head, the patient moves from prone back to supine. The head is now moved to nose up for one minute, then the therapist assists the patient in sitting up. As with the PRM, if nystagmus and/or vertigo (NOT lightheadedness) are seen here, repeat the entire procedure until the patient sits up asymptomatic.<sup>8</sup>

## **Conclusion**

While the symptoms of BPPV including whirling vertigo, nausea, and dysequilibrium may seem subjectively severe to the patient suffering from this disorder, it is relatively simple to diagnose and treatment strategies are highly effective. Both diagnosis and therapy are highly aided by the use of infrared goggles allowing for significant improvement in the observation, recording, and assessment of the classic nystagmus seen with this malady. Not only is BPPV the most commonly occurring vestibular problem, but it is also the most responsive to treatment.

## **REFERENCES**

1. Froehling DA, et al (1991) "Benign positional vertigo: incidence and prognosis in a population-based study in Olmsted County, Minnesota." Mayo Clinic Proc; 66:596-601.
2. Oas J G and Cherian N. (2001) "The Dix-Hallpike test is necessary but not sufficient in the diagnosis of Benign Paroxysmal Positional Vertigo (BPPV)" Abstracts of the twenty-fourth annual Midwinter Research Meeting of the Association for Research in Otolaryngology, #505.
3. Herdman SJ, Tusa RJ and Clendaniel RA (1994) "Eye movement signs in vertical canal benign paroxysmal positional vertigo." In: Contemporary Ocular Motor and Vestibular Research: A Tribute to David A. Robinson, Fuchs, et al (eds). Thieme, Stuttgart: 385-387.
4. Girardi, M. (1997) "The uses of Infra-red goggles for nystagmus testing." Vestibular Update. Micromedical Technologies, Inc., Springfield, IL, Spring Edition.
5. Herdman SJ and Tusa RJ, et al (1993) "Single treatment approaches to benign paroxysmal positional vertigo." Arch Otolaryngol Head Neck Surg. 119:450-54.
6. Tusa, RJ and Herdman SJ (1997) "Assessment and treatment of anterior canal Benign Paroxysmal Positional Vertigo using the Canalith Repositioning Maneuver (CRM)." Am Acad Neurology (ANN) Abstr Neurology, 48:A384.
7. Hain TC (1998) "Benign Paroxysmal Positional Vertigo," Patient Education Brochure, Vestibular Disorders Association, Portland, OR
8. Baloh RW, et al (1993) "Horizontal semicircular canal variant of Benign Positional Vertigo," Neurology, 43:2542-2549.
9. Konrad HR and Girardi M (1996) "Management of Benign Paroxysmal Positional Vertigo". Otolaryngol Head Neck Nursing 14:24-29.
10. Semont, et al (1988) "Curing the BPPV with a Liberator maneuver." Adv Otorhinolaryngol 42:290-293.
11. Li JC (1995) "Mastoid oscillation: a critical factor for success in the canalith repositioning procedure." Otolaryngol Head Neck Surg 112:670-675.
12. Amin M, Girardi M, Neill ME, Hughes LF, and Konrad HR (1999) "Effects of Exercise on Prevention of Recurrence of BPPV Symptoms", Abstracts of the twenty-second annual Midwinter Research Meeting of the Association for Research in Otolaryngology, #774.
13. Brandt T and Daroff RB (1980) "Physical therapy for benign paroxysmal positional vertigo." Arch Otolaryngol 106:484-485.

## **BIOGRAPHIES**

**Marian Girardi, MA**, is Director of the Vestibular Clinic in the Division of Otolaryngology, Department of Surgery at Southern Illinois University School of Medicine in Springfield, Illinois. Recently, Ms. Girardi was active in the development and implementation of the Balance Disorders/Falls Prevention Clinic, a multi-disciplinary clinic at SIU-SM and St. John's Hospital, and serves as its first director. She is highly involved with the testing, research and rehabilitation of patients with vestibular dysfunctions and other balance disorders. Her current research interests involve electronystagmography testing and interpretation, multiple treatment modalities for patients with vestibular system dysfunction, falls risk assessment and fall prevention in the elderly patient with multisensory disorders. She is currently completing work on her doctorate.

**Mary E. Neill, MA, CCC-A** is an audiologist working at the SIU-SOM Vestibular Clinic. She received her Master's in Audiology from Ohio State University, where she participated in psychoacoustics research. Current interests also include the neonatal hearing-screening program in the high-risk nursery at St. John's Hospital in Springfield IL.