



## BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)

*This handout is intended as a general introduction to the topic. As each person is affected differently, speak with your health care professional for individual advice.*



### Key points

- One of the most common causes of vertigo (spinning sensation).
- Most common in middle-aged and older people.
- Can increase the likelihood of falling.
- A problem with the motion sensors in the inner ear. Only one ear is affected, usually.
- Tiny calcium carbonate crystals fall out of the otolith organs (“pockets” in the inner ear) and into a semicircular canal (one of three tubes in the inner ear).
- Misplaced crystals bring on a sudden brief spinning sensation after a specific change in head position, such as lying down or rolling over in bed.
- To feel better and stop spinning, the crystals must be moved back into the pockets.
- A doctor or vestibular therapist can do this through guided head movements. In most cases, only one treatment needed.
- A minority have less-common variants – these are challenging to diagnose and treat.
- BPPV is unlikely if the spinning sensation lasts more than about a minute.

### What is BPPV?

Benign paroxysmal positional vertigo (BPPV) is the most common disorder of the organs of balance in the inner ear. It causes sudden attacks of brief vertigo, usually brought on by specific changes in head position.

Each word in the name describes part of the disorder:

- **Benign** – not a life-threatening health problem
- **Paroxysmal** – the symptoms come and go quickly
- **Positional** (sometimes the word “positioning” is used) – happens with certain changes in head position
- **Vertigo** – like you or the room is spinning, rather than feeling light-headed or woozy

BPPV can affect one or more of the semicircular canals in the inner ear at the same time. 80 to 90% of cases involve the posterior (rear) canal. It affects the horizontal canal in 10 to 20% of cases and the superior (top, also called anterior) canal in 3%.

BPPV affects about 2.5% of people at some point in their lives. Between 14 to 42% of patients with vertigo have BPPV.

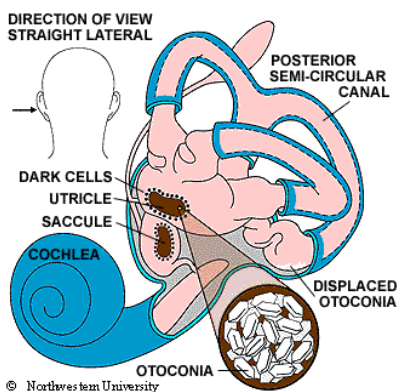
BPPV becomes increasingly more common with age. It is the main cause of dizziness in half of people over 50 years of age. BPPV can increase the likelihood of falling, particularly if you are older.

Women are 2 to 3 times more likely than men to have BPPV.

## What are the causes?

To understand what causes BPPV, it is important to have a basic understanding of how the inner ear balance mechanism (vestibular system) works.

The inner ear houses the snail-like organ of hearing (cochlea), as well as the organs of balance (utricle, saccule and three semicircular canals). The utricle responds to gravity and tells your brain whether you are moving up or down, right, or left, or backwards or forwards. This gravity receptor area houses tiny crystals of calcium carbonate (otoconia) on a jelly-like membrane.



### *Semicircular canals showing location of (otoconia)*

The semicircular canals lie at 90 degrees to one another. The horizontal canal sits parallel to the floor, the posterior at the back and the anterior at the top. The canals detect rotational movement and determine acceleration. They contain fluid (endolymph) and have tiny hair cells at the end area. As the inner ear fluid moves, the hair cells move, activating nerves that connect to the brain and tell the eyes what to do. In effect, the eyes are slaves to the vestibular system.

When crystals fall into a canal, however, normal interaction between the fluid and hair cells is disrupted. The canal becomes sensitive to changes in head position it would normally not respond to. It is this disruption that makes you feel as though you or your surroundings are spinning.

The exact body processes that cause the crystals to be dislodged remain unclear to researchers. There are several theories. Research in this area is continuing.

Some studies suggest that "dark cells" (see diagram above) act as "garbage disposals" by reabsorbing dislodged crystals.

Most cases of BPPV are idiopathic, meaning they happen for no apparent reason. This type of BPPV is also referred to as primary BPPV. The following can make you prone to having idiopathic BPPV:

- older age
- female gender
- unusual head positions, for example leaning your head back for a long time at the dentist's office or the hairdresser
- vitamin D deficiency: may contribute to a seasonal form of BPPV
- osteopenia and osteoporosis: age-related deterioration of structures in the inner ear or of the crystals may contribute to the crystals becoming dislodged and the development of BPPV.

About 80% of people with BPPV have either osteopenia (low bone mass) or osteoporosis (a disease that causes bones to become weak and brittle). Postmenopausal women with osteopenia or osteoporosis are about 3 times more likely than the general population of the same age to have BPPV. The role of estrogen (female sex hormone) in calcium metabolism may help explain why age and female gender are risks factors for BPPV.

One study suggests a link between BPPV and not eating enough carbohydrates and fibre as well as taking in a lot of polyunsaturated acids.

Secondary BPPV can develop due to a range of conditions that cause damage to the inner ear and lead to crystals coming loose.

These include:

- ear surgery
- head injuries including concussion
- jarring activities such as heading a soccer ball
- ear infections

- inner ear diseases such as Ménière's disease or vestibular neuritis
- medications that damage the balance structures in the inner ear (vestibular toxins)
- lying in bed for long periods of time

Some studies suggest an association between BPPV and dental procedures.

Compared to idiopathic BPPV, secondary cases are more likely to affect both ears (bilateral), require more than one treatment and recur more frequently.

## What are the symptoms?

The hallmark symptom of BPPV is vertigo (spinning sensation) that usually lasts less than 60 seconds. It most often occurs in spells. Vertigo spells may be frequent for several weeks and then go away. They may happen again several months later.

The activities that provoke the vertigo vary from person to person. It is most frequently brought on by a change in head position, such as rolling over in bed or reaching up or down to find something.

The symptoms vary widely in severity. Most people only have mild dizziness. Some have episodes that are severe enough to cause nausea and vomiting, significantly interfering with activities of daily living.

Often people are fine in between each brief episode of vertigo. They may feel slightly off balance but usually can carry on with activities of daily living. Some people may be sensitive to visually busy environments (visually induced dizziness).

Abnormal, uncontrollable eye movements (nystagmus) usually accompany the symptoms of BPPV.

## How is it diagnosed?

A general practitioner usually makes a diagnosis of BPPV. It is based on symptoms and the patient's medical history rather than lab tests, vestibular tests, or medical imaging.

The doctor will put your head through a series of guided movements called the Dix-Hallpike manoeuvre; this causes the crystals in the canal to move. As they fall downwards into the canal, fluid is pulled along. This activates the receptors in the posterior semicircular canal, causing your eyeballs to move quickly (nystagmus) and making you feel as though you are spinning. The Dix-Hallpike may be repeated several times.

The doctor will look at your eye movements and ask how you are feeling. The direction of your eye movements is used as a clue to diagnose which ear and canal contains the crystals. As the movement is sometimes very rapid, you might be asked to put on special goggles; these connect to a computer monitor that clearly graphs your eye movements.

The dizziness and eye movements do not start right away when you are put through the Dix-Hallpike manoeuvre. The crystals must overcome inertia before they start to fall. This is why it usually takes several seconds to become symptomatic when you put your head into a position that provokes vertigo.

When the dizziness starts, it comes on quite suddenly and fades away. The dizziness is brief because the crystals eventually find a new home at the end of the canal. At first, the particles move together like a ball. As the manoeuvre is done over and over, the crystals separate and stop working together. You become less symptomatic. When you sit up, your eye movements reverse in direction. This change is a good diagnostic clue.

## How is it treated and managed?

Effective treatment depends on accurate identification of the affected ear and semicircular canal. Treatments include:

### Canalith repositioning procedures (CRP)

Canalith (meaning “canal rocks”) repositioning procedures (CRP) are an effective, long-lasting, and non-invasive treatment for all types of BPPV. A doctor, audiologist, physiotherapist, or occupational therapist trained in CRP therapy can treat you during an office visit. The head is moved through a series of motions to return the crystals to where they belong. Symptoms usually subside immediately after treatment and the crystals reabsorb over the coming days.

Current treatment guidelines do not recommend any restriction in movements after CRP for posterior (rear) canal BPPV.

If CRP therapy is not done correctly, some crystals may fall into another canal. Sometimes the examiner sees a different and unexpected eye movement; this indicates that the particles have moved into another canal requiring a different manoeuvre to fix the problem. And sometimes the procedure moves some of the particles but not all, requiring another treatment.

### Posterior (rear) semicircular canal BPPV

Most BPPV affects the posterior canal. Over 85% of cases can be successfully treated by the Epley manoeuvre. The Semont, Parnes and Gans manoeuvres are equally effective. If the manoeuvres are not done perfectly or if the head is lifted up, for example, some of the particles may fall backwards or into another canal. This is called canal conversion and is more likely with the Epley than the Semont manoeuvre (almost 8% compared with 0%).

Further investigation will be needed to rule out a central cause (originating in the brain) in cases when repositioning procedures do not successfully

resolve nystagmus (involuntary eye movements) brought about by a change in head position.

Ménière's disease and BPPV frequently overlap; you can have both. Canal re-positioning procedures work for positional vertigo secondary to a Ménière's spell but do not work to treat the actual disease.

### Home-based treatment

While treatment by a trained health practitioner is usually the preferred option, canalith-repositioning procedures and exercises done at home can be equally effective if the head is put through a sequence of movements appropriate to the affected canal with enough speed.

The success of home-based treatment depends on proper diagnosis and detailed instruction from a trained health practitioner. If you have a condition that limits your ability to move, you may not be able to do the procedures and exercises safely. These conditions include neck or back issues, vascular disorders, and retinal detachment.

If you have a clear diagnosis of BPPV in the posterior canal, the DizzyFIX<sup>®</sup> device may help. Check with your healthcare provider to confirm that it is appropriate and safe for you.

Older people and those with a history of head injury or inner ear (vestibular) problems have a recurrence of symptoms about half the time. Home-based treatment is more successful for younger people; their symptoms only have about a 7% chance of coming back.

The Foster Half Somersault Maneuver is an alternative to the Epley that is meant to be self-taught and performed. Depending on how dizzy, fit, and healthy you are, it may be difficult to accomplish.

The Brandt-Daroff exercise can also be done at home. These habituation exercises will not cure BPPV. They can, however, help speed up the process in which your brain learns how to ignore false signals from the parts of the inner ear that detect motion. This is called compensation.

If you are not certain about which canal is affected, or exactly how to do these procedures and exercises, have back or neck problems, or cannot do them quickly enough on your own, have CRP therapy done by a professional.

## Medication

As BPPV is essentially a mechanical disorder, taking medication cannot cure it. Some medications, such as antihistamines and sedatives, act as vestibular suppressants and reduce the spinning sensation of vertigo. Using them for a short period of time can help control severe nausea and vomiting. However, because vestibular suppressants slow down the brain's ability to adjust to the abnormal signals triggered by the particles in the inner ear, they should not be taken for an extended period of time.

## Surgery

Surgery to block a canal may be considered if several treatments with repositioning manoeuvres are unsuccessful or if the BPPV continues to recur.

Blocking a canal is not a common procedure and is only done after every other treatment has been tried. As fluid can leak out when the canal is plugged, patients are at risk of complete hearing loss in that ear.

## Less common variants of BPPV

A minority of patients have less common variants of BPPV. They may have crystals stuck in a canal, in more than one canal, or on both sides of their head. These patients are difficult to diagnose and treat. Their eye movements are complicated. It takes a specialist a lot of time, expertise, and patience to figure out the problem.

Sometimes there is a "traffic jam" of particles in the canal and it is completely blocked. The expected eye movements are seen only when a skull vibrator is used to start dispersing the particles.

Cupulolithiasis is one variant that is a challenge to treat. The eye movements last longer, are very violent and last for as long as the head is in the

triggering position. No number of repositioning manoeuvres will move the clump of particles stuck on a semicircular canal cupula. In these cases, a skull vibrator is sometimes applied successfully to convert the clump to free-floating particles; these are easier to treat.

Particles in the horizontal canal are very troublesome for most patients. The symptoms can be quite violent. They are diagnosed by simply watching your eye movements when you lie down and roll from one side to the other. It is, however, complicated to determine which ear is involved. It stumps most otolaryngologists (ENT doctors) because the eye movements are totally different depending on whether the particles are free-floating or stuck to the hinged joint (cupula).

By analyzing a graph of the exceptionally rapid eye movements, a sub-specialist (neuro-otologist or otoneurologist) can determine if the left or right ear is involved. One treatment is the aptly named BBQ roll. The patient is turned around and around as

though on a spit. It is unpleasant for many individuals, causing both dizziness and discomfort.

Particles in the superior (top, also called anterior) canal are treated with a variety of procedures including the Epley, reverse Epley and Yacovino manoeuvres. The average success rate is about 85%. Patients themselves frequently or inadvertently treat particles in the superior canal even before they reach the specialist's office. Because the particles usually lie up at the top of the head, lying down or sitting up causes them to fall back where they belong.

In some patients, the particles get stuck on the hinged joint. However, the Dix-Hallpike manoeuvre usually fixes this issue, so many ENTs and physiotherapists are coincidentally fixing the problem during testing.

## What to expect in the future

Research suggests that CRP therapy resolves symptoms in 85% of patients with BPPV after a single manoeuvre. Only 2% of patients need more than three treatments. Failure of CRP therapy to provide relief is associated with factors such as head injury, age, and osteoporosis.

Someone who has had BPPV is likely to get it again, however when is not predictable.

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