WORLD SKULL BASE E-LEARNING MATERIAL

Benign Paroxysmal Positional Vertigo

Benign paroxysmal positional vertigo

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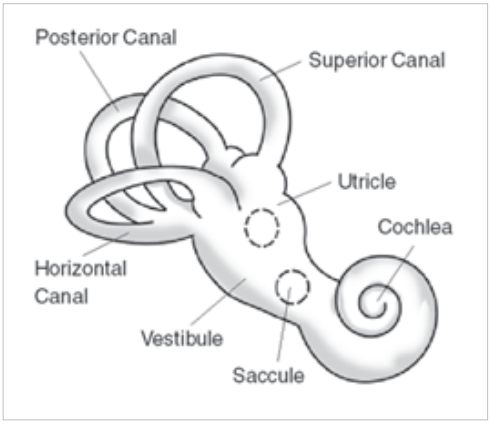
Classification and external resources	
 Exterior of labyrinth of the inner ear.	
ICD-10	H81.1 [1]
ICD-9	386.11 [2]
OMIM	193007 [3]
DiseasesDB	1344 [4]
MedlinePlus	001420 [5]
eMedicine	ent/761 [6] emerg/57 [7] neuro/411 [8]
MeSH	D014717 [9]

Benign paroxysmal positional vertigo (**BPPV**) is a disorder arising in the inner ear. Its symptoms are repeated episodes of positional vertigo, that is, of a spinning sensation caused by changes in the position of the head.[] BPPV is the most common cause of the symptoms of vertigo.[10]

Classification

Vertigo, a distinct process sometimes confused with dizziness, accounts for about 6 million clinic visits in the U.S. every year, and 17–42% of these patients eventually are diagnosed with BPPV.[] Other causes of vertigo include:

- Motion sickness/Motion Intolerance: a disjunction between visual stimulation, vestibular stimulation, and/or proprioception
- Visual exposure to nearby moving objects (examples of optokinetic stimuli: passing cars, falling snow)
- Other diseases: (labyrinthitis, Ménière's disease, migraine.[11] etc.)

Signs and symptoms

- Symptoms
  - Vertigo: Spinning dizziness, which must have a rotational component.
  - Short duration (paroxysmal): Lasts only seconds to minutes
  - Positional in onset: Can only be induced by a change in position.
  - Nausea is often associated
  - Visual disturbance: It may be difficult to read or see during an attack due to associated nystagmus.
  - Pre-syncope (feeling faint) or syncope (fainting) is unusual.
  - Emesis (vomiting) is uncommon but possible.
- Signs
  - Rotatory (torsional) nystagmus, where the top of the eye rotates towards the affected ear in a beating or twitching fashion, which has a latency and can be fatigued (the vertigo should lessen with deliberate repetition of the provoking maneuver).
  - Nystagmus should only last for 30 seconds to one minute.

Patients do not experience other neurological deficits such as numbness or weakness, and if these symptoms are present, a more serious etiology such as posterior circulation stroke or ischemia, must be considered.

The spinning sensation experienced from BPPV is usually triggered by movement of the head, will have a sudden onset, and can last anywhere from a few seconds to several minutes. The most common movements patients report triggering a spinning sensation are tilting their head upwards in order to look at something, and rolling over in bed.[10]

Cause

Within the labyrinth of the inner ear lie collections of calcium crystals known as otoconia or otoliths. In patients with BPPV, the otoconia are dislodged from their usual position within the utricle and migrate over time into one of the semicircular canals (the posterior canal is most commonly affected due to its anatomical position). When the head is reoriented relative to gravity, the gravity-dependent movement of the heavier otoconial debris (colloquially "**ear rocks**") within the affected semicircular canal causes abnormal (pathological) fluid endolymph displacement and a resultant sensation of vertigo. This more common condition is known as **canalithiasis**.

In rare cases, the crystals themselves can adhere to a semicircular canal cupula rendering it heavier than the surrounding endolymph. Upon reorientation of the head relative to gravity, the cupula is weighted down by the dense particles thereby inducing an immediate and maintained excitation of semicircular canal afferent nerves. This condition is termed **cupulolithiasis**.

There is evidence in the dental literature that malleting of an osteotome during closed sinus floor elevation, otherwise known as *osteotome sinus elevation* or *lift*, transmits enough percussive and vibratory forces capable of detaching otoliths from their normal location and leading to the symptoms of BPPV.[12][13]

It can be triggered by any action which stimulates the posterior semi-circular canal which may be:

- Tilting the head
- Rolling over in bed
- Looking up or under
- Sudden head motion
- Post head injury

BPPV may be made worse by any number of modifiers which may vary between individuals:

- Changes in barometric pressure - patients often feel symptoms approximately two days before rain or snow
- Lack of sleep (required amount of sleep may vary widely)

- Stress

BPPV is one of the most common vestibular disorders in patients presenting with dizziness and migraine is implicated in idiopathic cases. Proposed mechanisms linking the two are genetic factors and vascular damage to the labyrinth.[14]

Although BPPV can occur at any age, it is most often seen in people over the age of 60.[15] Besides aging, there are no major risk factors known for developing BPPV, although previous episodes of trauma to the head or inner ear infections known as labyrinthitis, may predispose individuals to future development of BPPV.[10]

Diagnosis

The condition is diagnosed by the patient's history, and by performing the Dix-Hallpike maneuver and/or the roll test.[16] Patients with BPPV will report a history of vertigo as a result of fast head movements. Many patients are also capable of describing the exact head movements that provokes their vertigo.[]

The Dix-Hallpike test is a common test performed by examiners to determine whether the posterior semicircular canal is involved.[] It involves a reorientation of the head to align the posterior semicircular canal (at its entrance to the ampulla) with the direction of gravity. This test will reproduce vertigo and nystagmus characteristic of posterior canal BPPV.[16]

When performing the Dix-Hallpike test, patients are descended quickly to a supine position with the neck extended by the clinician performing the maneuver. For some patients, this maneuver may not be indicated and a modification may be needed that also targets the posterior semicircular canal. Such patients include those who are too anxious about eliciting the uncomfortable symptoms of vertigo and those who may not have the range of motion necessary to comfortably be in a supine position. Obesity can also present a challenge when performing this assessment. The modification involves the patient moving from a seated position to side-lying without their head extending off the examination table, such as with Dix-Hallpike. The head is rotated 45 degrees away from the side being tested and the eyes are examined for nystagmus. A positive test is indicated by patient report of a reproduction of vertigo and nystagmus. Both the Dix-Hallpike and the side-lying testing position have yielded similar results and as such the side-lying position can be used if the Dix-Hallpike cannot be performed easily.[17]

The roll test can determine whether the horizontal semicircular canal is involved.[16] The roll test requires the patient to be in a supine position with his/her head in 20° of cervical flexion. Then the examiner quickly rotates the head 90° to the left side, and checks for vertigo and nystagmus. This is followed by gently bringing the head back to the starting position. The examiner then quickly rotates the head 90° to the right side, and checks for vertigo and nystagmus.[16] In this roll test, the patient may experience vertigo and nystagmus on both sides, but rotating towards the affected side will trigger a more intense vertigo. Similarly, when the head is rotated towards the affected side, the nystagmus will beat towards the ground and be more intense.[]

As mentioned above, both the Dix-Hallpike and roll test provoke the signs and symptoms in subjects suffering from archetypal BPPV. The signs and symptoms patients with BPPV experience are typically a short-lived vertigo, and observed nystagmus. In some patients, though rarely, the vertigo can persist for years. Assessment of BPPV is best done by a health professional skilled in management of dizziness disorders, commonly a physiotherapist, audiologist or other medical physician.

The nystagmus associated with BPPV has several important characteristics which differentiate it from other types of nystagmus.

- Positional: the nystagmus occurs only in certain positions
- Latency of onset: there is a 5-10 second delay prior to onset of nystagmus
- Nystagmus lasts for 5–120 seconds
- Visual fixation suppresses nystagmus due to BPPV

- Rotatory/Torsional component is present or (in the case of lateral canal involvement) the nystagmus beats in either a geotropic (towards the ground) or ageotropic (away from the ground) fashion
- Repeated stimulation, including via Dix-Hallpike maneuvers, cause the nystagmus to fatigue or disappear temporarily.

Although rare, CNS disorders can sometimes present as BPPV. A practitioner should be aware that if a patient whose symptoms are consistent with BPPV, but does not show improvement or resolution after undergoing different particle repositioning maneuvers, which are detailed in the Treatment section below, need to have a detailed neurological assessment and imaging performed to help identify the pathological condition.[]

Treatment

Two treatments have been found effective for relieving symptoms of posterior canal BPPV: the canalith repositioning procedure (CRP) or Epley maneuver,[] and the liberatory or Semont maneuver.[] The CRP employs gravity to move the calcium build-up that causes the condition.[18] The particle repositioning maneuver can be performed during a clinic visit by health professionals or taught to patients to practice at home. In the Semont maneuver, patients themselves are able to achieve canalith repositioning.[19] Both treatments, when performed by a health professional, appear to be equally effective. When practiced at home, the CRP is more effective than the Semont maneuver. The most effective repositioning treatment for posterior canal BPPV is the therapist-performed CRP combined with home practiced CRP.[20]

The Epley maneuver (particle repositioning) does not address the actual presence of the particles (otoconia), rather it changes their location. The maneuver aims to move these particles from some locations in the inner ear which cause symptoms such as vertigo, and reposition them to where they do not cause these problems.

The Brandt-Daroff exercises may be prescribed by the clinician as a home treatment method usually in conjunction with particle repositioning maneuvers or in lieu of the particle repositioning maneuver. The exercise is a form of habituation exercise, designed to allow the patient to become accustomed to the position which causes the vertigo symptoms. The Brandt-Daroff exercises are performed in a similar fashion to the Semont maneuver; however, as the patient rolls onto the unaffected side, the head is rotated toward the affected side.[21] The exercise is typically performed 3 times a day with 5-10 repetitions each time, until symptoms of vertigo have resolved for at least 2 days.[16]

For the Lateral (Horizontal) canal, a separate maneuver has been used for productive results. It is unusual for the lateral canal to respond to the canalith repositioning procedure used for the posterior canal BPPV. Treatment is therefore geared towards moving the canalith from the lateral canal into the vestibule.[22] The roll maneuver or its variations are used and involves rolling the patient 360 degrees in a series of steps to reposition the particles.[][23] This maneuver is generally performed by a trained clinician who begins seated at the head of the examination table with the patient supine[] There are four stages, each a minute apart and at the third position the horizontal canal is oriented in a vertical position with the patient's neck flexed and on forearm and elbows.[] When all four stages are completed, the head roll test is repeated and if negative treatment ceases.[]

Medical treatment with anti-vertigo medications may be considered in acute, severe exacerbation of BPPV, but in most cases are not indicated. These primarily include drugs of the anti-histamine and anti-cholinergic class, such as meclizine and scopolamine respectively. The medical management of vestibular syndromes has become increasingly popular over the last decade, and numerous novel drug therapies (including existing drugs with new indications), have emerged for the treatment of vertigo/dizziness syndromes. These drugs vary considerably in their mechanisms of action, with many of them being receptor or ion channel-specific. Among them, include betahistine or dexamethasone/gentamicin for the treatment of Ménière's disease, carbamazepine/oxcarbazepine for the treatment of paroxysmal dysarthria and ataxia in multiple sclerosis, metoprolol/topiramate or valproic acid/tricyclic antidepressant for the treatment of vestibular migraine, and 4-aminopyridine for the treatment of episodic ataxia type 2 and downbeat and upbeat nystagmus.[] These drug therapies offer symptomatic treatment, and do not affect the

disease process or resolution rate. Medications may be used to suppress symptoms during the positioning maneuvers if the patient's symptoms are severe and intolerable. More dose-specific studies are required however, in order to determine the most effective drug(s) for both acute symptom relief and long term remission of the condition. For a complete list of these novel therapies and their associated target symptoms, follow the link below to the Informahealthcare website.[]

Surgical treatments, such as a semi-circular canal occlusion, do exist for BPPV but carry the same risk as any neurosurgical procedure. Surgery is reserved as a last resort option for severe and persistent cases which fail vestibular rehabilitation (including particle repositioning and habituation therapy).

Devices such as a head over heels "rotational chair" are available at some tertiary care centers[24] Home devices, like the DizzyFIX, are also available for the treatment of BPPV and vertigo.[25]

The Semont maneuver has a cure rate of 90.3%.[26] It is performed as follows:

1. The patient is seated on a treatment table with their legs hanging off the side of the table. The therapist then turns the patient's head towards the unaffected side 45 degrees.
2. The therapist then quickly tilts the patient so they are lying on the affected side. The head position is maintained, so their head is turned up 45 degrees. This position is maintained for 3 minutes. The purpose is to allow the debris to move to the apex of the ear canal.
3. The patient is then quickly moved so they are lying on the unaffected side with their head in the same position (now facing downwards 45 degrees). This position is also held for 3 minutes. The purpose of this position is to allow the debris to move toward the exit of the ear canal.
4. Finally, the patient is slowly brought back to an upright seated position. The debris should then fall into the utricle of the canal and their symptoms of vertigo should decrease or end completely. Some patients will only need one treatment, but others may need multiple treatments depending on the severity of their BPPV.

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External links

- VEDA (http://www.vestibular.org/vestibular-disorders/specific-disorders/bppv.php) Vestibular Disorder Association webpage concerning BPPV
- Benign Positional Vertigo (http://emedicine.medscape.com/article/1158940-overview). eMedicine at WebMD
- MayoClinic (http://www.mayoclinic.org/balance/bppv.html)
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Great summary and picturgraphs of treatment positions.

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