Vertigo and dizziness

Professor Samuel Komoly MD PhD DsC
Vertigo and dizziness
(National Institutes of Health)

• Life time prevalence: 42%
• over 75 the most frequent complain
• ‘U.S. physicians report a total of more than 5 million dizziness-vertigo visits a year’
vertigo

- is an illusion of rotation and that it is always due to asymmetry of neural activity between the left and right vestibular system
- vertigo is always temporary
- vertigo is always made worse by head movement,
Frequency of different vertigo syndromes in 5353 patients seen in a dizziness unit (1989-2004)

- Benign paroxysmal positioning vertigo
- Phobic postural vertigo
- Central-vestibular vertigo
- Vestibular migraine
- Menière's disease
- Vestibular neuritis
- Bilateral vestibulopathy
- Psychogenic vertigo
- Vestibular paroxysmia
- Perilymph fistula
- Unknown vertigo syndromes
Acoustic neurinoma not shown by CT
Frequency of different vertigo syndromes in 5353 patients seen in a dizziness unit (1989-2004)

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benign paroxysmal positioning vertigo (BPPV)


• BPPV was first described by Barany in 1921
BENIGN PAROXYSMAL POSITIONING VERTIGO (BPPV)

- is the single most common cause of vertigo
- “Doctor, whenever I turn in bed at night, or I hang the washing on the line or look under my car...I got spinning (or everything is spinning around me)”
- BPPV will occur in bouts lasting several weeks (but one attack is always shorter than 60 second!)
- and will then spontaneously remit,
- only to return weeks, months, or even years later.
Fortnightly Review

Benign positional vertigo: recognition and treatment

Thomas Lempert, Michael A Gresty, Adolfo M Bronstein

Dizziness is one of the most common complaints in general practice, and yet doctors often find it difficult to establish a firm diagnosis in individual patients. Benign positional vertigo accounts for about a fifth of the referrals to specialised vertigo clinics\(^1\) and is the most commonly missed treatable condition. Fortunately, it can be readily diagnosed by positional testing. Recent insights into its pathophysiology have provided new means of effective treatment that can be applied in clinics.

64/1000

Epidemiology

The incidence of benign positional vertigo is conservatively estimated to be 64 per 100,000 population per year. Therefore a general practitioner is likely to see several new patients every year. Age at onset spans from childhood to senescence, but most patients are over 40.\(^2\) Women are affected about twice as often as men.\(^3\)

Symptoms and natural course

Vertigo; viral neuritis and head trauma are the most common, followed by vascular, inflammatory, and surgical damage to the labyrinth. In about 60% of cases no apparent cause can be identified.\(^4\)

The condition tends to resolve spontaneously after several weeks or months. Some patients, however, experience recurrences months or years later. Variants range from a single shortlived episode to decades of suffering with only short remissions.

Positional testing

The diagnosis is confirmed by positional testing as described by Dix and Hallpike (Hallpike manoeuvre; fig 1).\(^5\) The classic nystagmus of benign positional vertigo occurs when the head is reclined and turned to the affected side. It is characterised by its direction and time course.\(^6\) For example, when the left ear is affected the nystagmus occurs when the head is hanging to the left. The examiner will see alternating quick eye rotations around the line of sight towards the left (undermost) ear and slow rotations in the opposite direction, which constitute a torsional nystagmus (fig 2). Recognition of torsional nystagmus (which is
Epidemiology

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BENIGN PAROXYSMAL POSITIONING VERTIGO (BPPV)

• The patient with repeated bouts of vertigo over several decades with no abnormalities on examination, has BPPV.

• Recently, it has become clear that the cause of BPPV is the movement of stray otoconial particles within the duct of the posterior semicircular canal.
In Benign Paroxysmal Positional Vertigo (BPPV) dizziness is thought to be due to debris which has collected within a part of the inner ear. This debris can be thought of as "ear rocks", although the formal name is "otoconia". Ear rocks are small crystals of calcium carbonate derived from a structure in the ear called the "utricle" (figure 1).
Experiment that support the theory of canalolithiasis

Figure 2. (A−D) Successive head and body positions during backward rotation of the (left) posterior semicircular canal. The patient's head is turned 55 degrees toward the affected side throughout the procedure. The top row illustrates the stepwise migration of particles within the posterior canal during backward rotation. For forward rotation the sequence is reversed.

Protocol. Only backward rotation was applied in the after forward and backward rotation in these 14 patients is
Diagnosis of BENIGN PAROXYSMAL POSITIONING VERTIGO (BPPV)

- The positioning test, as described by Bárány, perfected by Dix and popularised by Hallpike, is the cornerstone of diagnosis and now of treatment.
Difficulties??

- However, two of the most commonly heard are "the couch in my room is placed awkwardly to do a Hallpike, I just cannot get the patient’s head to hang off the couch" and "we have not got Frenzel’s glasses in our clinic". Wrong. A positional manoeuvre can be done with a couch in any position and Frenzel’s glasses are definitely not required for any positional nystagmus, BPPV included "((Bronstein, J Neurol Neurosurg Psychiatry 2003;74:289-293)"
• „There are no excuses for not conducting a positional manoeuvre.” (Professor A M Bronstein, Academic Department of Neuro-otology, Imperial College London W6 8RF, UK; A.Bronstein@ic.ac.uk)
Dix-Hallpike maneuver  "Variant" Hallpike maneuver

BPPV (BMJ, 1995. aug)
Benign positional vertigo of the posterior canal

- "The involvement of the posterior canal accounts for about 80% to 95% of cases and causes brief attacks of vertigo that are precipitated by rapid extension or flexion of the head and lateral head tilts." Patients typically experience vertigo when turning over in bed, lying down from the sitting position, sitting up from supine, extending the neck to look up, or bending over. They may wake up with vertigo when turning in bed. The illusion of movement is usually rotatory, but a sensation of body tilt can also occur. Other complaints during the attack include imbalance, oscillopsia, and vegetative symptoms such as nausea, sweating, and tachycardia. Patients are usually aware that certain head movements precipitate attacks of vertigo. They often develop strategies to avoid vertiginous attacks, eg, sleeping upright or holding their neck stiff, but this may lead to immobility and prolongation of the natural course of the disorder.

- A single attack of posterior canal benign paroxysmal positional vertigo usually lasts 10 to 20 seconds and never lasts longer than 1 minute. However, after a flurry of attacks, patients may complain of prolonged nonspecific dizziness and imbalance lasting from hours to days. Typically, posterior canal benign paroxysmal positional vertigo manifests itself with symptomatic episodes lasting from a few days to several months, interspersed by asymptomatic intervals of several months to years duration.
Caloric testing

- Caloric hyporesponsiveness was found in 30% of patients with idiopathic posterior canal benign paroxysmal positional vertigo (Baloh et al 1987) and horizontal canal benign paroxysmal positional vertigo (Baloh et al 1993).
- Caloric hyporesponsiveness in horizontal canal benign paroxysmal positional vertigo can be reversible after a successful liberatory maneuver and has been attributed to partial plugging of the horizontal canal (Strupp et al 1995).
Epley’s maneuver
http--neurology.pote.hu

download:http://www.neurology.org/cgi/content/full/63/1/150/DC1
Epley maneuver

• „The liberatory maneuvers have no serious adverse effects and effective”.
Epley maneuver

• “There is evidence that therapeutic maneuvers are even useful in patients who, in spite of a typical history, do not show nystagmus on diagnostic positioning” (Tirelli et al 2001; Haynes et al 2002).
Epley maneuver is very effective

• „The recurrence rate after successful treatment has been estimated at (only) 15% per year (Nunez et al 2000).”

- “patients have a high prevalence of falls (‘otolithic drop attack of Tumarkin’)”
- “Secondary anxiety disorders may develop in predisposed individuals and may persist after an acute bout has settled”
Tumarkin's otolithic drop attack

- characterized by a sudden drop attack without accompanying loss of consciousness, vertigo or autonomic signs, is a rare phenomenon thought to be of peripheral origin
• Normally otoconia appear to have a slow turnover. They are probably dissolved naturally as well as actively reabsorbed by the "dark cells" of the labyrinth (Lim, 1973, 1984), which are found adjacent to the utricle and the crista, although this idea is not accepted by all (see Zucca, 1998, and Buckingham, 1999).
process of **vestibular compensation**

Halmágyi JNNP, 2004

• „Even after the **vestibular nerve** on one side has been **surgically severed**, the terrible vertigo and nystagmus that follow will **always abate within a few days**, **not** because the **vestibular nerve** has reanastomosed but because profound neurochemical changes have taken place in the brainstem during the **process of vestibular compensation**”
Because the vestibular system interacts with many other parts of the nervous system, symptoms may also be experienced as problems with vision, muscles, and thinking, and memory.
Patients with vestibular disorders often report fatigue and loss of stamina and an headache and muscle pain, sensitivity to bright light.

When these symptoms are constant and disabling, they may be accompanied by irritability, loss of self-esteem, and/or depression.
Table 8  Abnormal computerised psychiatric assessment scores in dizzy subjects and controls

<table>
<thead>
<tr>
<th></th>
<th>Dizzy subjects (n (%)</th>
<th>Control subjects (n %)</th>
</tr>
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<tbody>
<tr>
<td>Somatic symptoms</td>
<td>21 (60.0)</td>
<td>4 (11.1)</td>
</tr>
<tr>
<td>Worry about physical health</td>
<td>14 (40.0)</td>
<td>5 (13.9)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>30 (85.7)</td>
<td>12 (33.3)</td>
</tr>
<tr>
<td>Irritability</td>
<td>26 (74.3)</td>
<td>10 (27.8)</td>
</tr>
<tr>
<td>Poor concentration</td>
<td>21 (60.0)</td>
<td>10 (27.8)</td>
</tr>
<tr>
<td>Depression</td>
<td>16 (45.7)</td>
<td>5 (13.9)</td>
</tr>
<tr>
<td>Phobias</td>
<td>13 (37.1)</td>
<td>1 (2.8)</td>
</tr>
<tr>
<td>Worry</td>
<td>22 (62.9)</td>
<td>17 (47.2)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>17 (48.6)</td>
<td>8 (22.2)</td>
</tr>
<tr>
<td>Compulsions</td>
<td>3 (8.6)</td>
<td>2 (5.6)</td>
</tr>
<tr>
<td>Obsessions</td>
<td>9 (25.7)</td>
<td>3 (8.3)</td>
</tr>
</tbody>
</table>
Neuro-otological and psychiatric abnormalities in a community sample of people with dizziness: a blind, controlled investigation

• **RESULTS:** dizzy subjects ........ higher prevalence of psychiatric morbidity.

• (J Neurol Neurosurg Psychiatry 1998;65:679-684)
• „As the combination of minor physical and psychiatric disorder is known to be unusually persistent and handicapping, treatment programmes must be provided for this prevalent syndrome” (J Neurol Neurosurg Psychiatry 1998;65:679-684)
Vertigo and panic

• patients with recurrent undiagnosed vertigo can develop panic attacks
• go on to develop in addition to panic chronic anxiety, even agoraphobia.
"Phobic postural vertigo"

- often with obsessive-compulsive personalities
- mild subjective disturbance of balance while standing or walking,
- The symptoms usually occur in specific places (bridges, metro, supermarkets)
- or in specific situations, and are associated with a distressing anxiety.
- Many cases follow a clear, well documented peripheral vestibulopathy.
Course of illness in phobic postural vertigo.
Kapfhammer HP; Mayer C; Hock U; Huppert D; Dieterich M; Brandt T

Acta Neurol Scand, 1997 Jan, 95:1, 23-8

• „Despite a considerable rate of improvement in vertigo complaints (79%), the group of patients with phobic postural vertigo as a whole presented with significant psychological problems at follow-up term (74%), requiring specific psychiatric and/or psychotherapeutic interventions”: antidepresszans (fluvoxamne, fluoxetine, venlaxine)
Migraine is a common disorder that has been associated with a number of vestibular syndromes. The relationship between headache and vertigo has been known for many years since the writings of Living in 1873 (quoted by Kayan and Hood). Vestibular symptoms may be either spontaneous or motion-induced and are estimated to occur in 25–54% of unselected migraine subjects. Vertigo may occur as a prodromal feature in migraine with aura, at the same time as the headache, or during the headache-free period. Other entities such as benign recurrent vertigo and benign paroxysmal positional vertigo (BPPV) have been described in association with migraine, and motion sickness is also reported to be more common in migraineurs.
The interrelations of migraine, vertigo, and migrainous vertigo

Table 1 Lifetime prevalence of migraine and migrainous vertigo in the three study groups

<table>
<thead>
<tr>
<th></th>
<th>Migraine clinic group</th>
<th>Dizziness clinic group</th>
<th>Control group</th>
<th>Dizziness clinic vs control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine without aura</td>
<td>131</td>
<td>49 (25)</td>
<td>35 (18)</td>
<td>NS</td>
</tr>
<tr>
<td>Women</td>
<td>104</td>
<td>38</td>
<td>30</td>
<td>NS</td>
</tr>
<tr>
<td>Men</td>
<td>27</td>
<td>11</td>
<td>5</td>
<td>NS</td>
</tr>
<tr>
<td>Migraine with aura</td>
<td>69</td>
<td>26 (13)</td>
<td>12 (6)</td>
<td>p &lt; 0.05</td>
</tr>
</tbody>
</table>
Summary A series of 16 subjects is described who presented with chronic vertigo that was thought to be migrainous in nature. The vertigo occurred on a daily basis and had been present for six months or more. Common symptoms included motion-induced dizziness, positional vertigo and motion sensitivity. Investigations were frequently normal apart from the finding of atypical positional nystagmus in four subjects and unilateral vestibular hypofunction in two subjects. It was frequently not possible to make a diagnosis of migraine on the basis of International Headache Society criteria, however the dramatic beneficial response to anti-migraine therapy supported the hypothesis that the vertigo was migrainous in nature.
**Table 1.** Neuhauser's diagnostic criteria for migrainous vertigo (Adapted from Neuhauser, 2001).

<table>
<thead>
<tr>
<th>Diagnosis of migrainous vertigo requires ALL of the following:</th>
<th>3. One or more migraine symptoms has occurred with episodic vestibular attacks:</th>
</tr>
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<tbody>
<tr>
<td>1. Lifetime diagnosis of migraine</td>
<td>a. Migraine headache, OR</td>
</tr>
<tr>
<td>2. Vestibular symptoms that:</td>
<td>b. Photophobia, OR</td>
</tr>
<tr>
<td>a. Are intermittent, not constant, AND</td>
<td>c. Phonophobia, OR</td>
</tr>
<tr>
<td>b. Are more than simple dizziness (e.g., vertigo, illusory motion, or head motion intolerance), AND</td>
<td>d. Aura (other than dizziness)</td>
</tr>
<tr>
<td>c. Interfere with daily activities, AND</td>
<td>4. No hearing loss or neurologic or otologic pathology to explain balance abnormalities (E.g., patients with Menière’s disease would not be diagnosed with migrainous vertigo)</td>
</tr>
<tr>
<td>d. Are not caused by identified pathology</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Structured interview for migraineous vertigo (SIM-V; adapted from Furman, 2003).

<table>
<thead>
<tr>
<th>Question</th>
<th>Criteria</th>
</tr>
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<tbody>
<tr>
<td>Do you have migraine?</td>
<td>• Migraine with aura (Define aura: ____________________________________________________________________________)&lt;br&gt;• Migraine without aura&lt;br&gt;Must have 5 or more episodes of headache associated with:&lt;br&gt;2 of the following: unilateral location, throbbing pain, moderate-to-severe pain, or worsened by performing routine activities, AND&lt;br&gt;1 of the following: photophobia and phonophobia, or nausea, AND&lt;br&gt;Not caused by known pathology&lt;br&gt;NO (STOP) YES (If yes, proceed to next question.)</td>
</tr>
<tr>
<td>Do you sometimes experience any of the following:</td>
<td>• Dizziness or lightheadedness&lt;br&gt;• Vertigo&lt;br&gt;• A feeling of abnormal motion&lt;br&gt;Like walking on the deck of a boat&lt;br&gt;Objects in the room seem to spin or turn around you&lt;br&gt;You feel like you're spinning or turning, when you're really not moving&lt;br&gt;Sense of imbalance, abnormal motion, nausea, or vertigo when you move your head&lt;br&gt;Tendency to veer to the side when trying to walk straight&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>If none or only dizziness/lightheadedness, STOP.&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>If symptoms other than dizziness/lightheadedness, then proceed to next question.</td>
</tr>
<tr>
<td>Have you ever been evaluated for symptoms of dizziness, vertigo, or a balance disorder?</td>
<td>• YES: What was your diagnosis?&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td>If diagnosed with a brain or neurological disorder or inner ear disease (e.g., Menière's), STOP.&lt;br&gt;• NO (If NO, proceed to next question.)</td>
</tr>
<tr>
<td>Do you have chronic hearing loss or ringing in your ears along with your balance problem?</td>
<td>• YES to either question (STOP)&lt;br&gt;• NO to both questions (If NO, proceed to next question.)</td>
</tr>
<tr>
<td>Do you have abnormal balance symptoms all the time or do they come and go?</td>
<td>If you have balance symptoms all the time, does the severity fluctuate?&lt;br&gt;• Constant AND Nonfluctuating (STOP)&lt;br&gt;• Intermittent or Fluctuating in severity (If intermittent or fluctuating, proceed to the next question.)</td>
</tr>
<tr>
<td>How do your episodic or fluctuating symptoms of imbalance interfere with your daily activities:&lt;</td>
<td>• Symptoms do not interfere. (Rate as MILD and STOP.)&lt;br&gt;• Symptoms usually interfere but do not prohibit daily activities. (Rate as MODERATE and continue to the next question.)&lt;br&gt;• Symptoms usually prohibit daily activities. (Rate as SEVERE and continue to next question.)</td>
</tr>
<tr>
<td>Has one of the following symptoms occurred at least twice at the same time that you experienced either episodic balance attacks or when you experienced increased severity of fluctuating balance symptoms?</td>
<td>• Migraine headache (as defined by the Headache Diagnostic Interview)&lt;br&gt;• Markedly increased sensitivity to EITHER normal room lighting OR conversational speech (The person should report a need to turn down or off lights/radio/television, close curtains or blinds, or need to retreat to dark, quiet room.)&lt;br&gt;• Migrainous aura (visual scotoma, visual hallucination, weakness or numbness on one side of the body. DO NOT score positive if the &quot;aura&quot; symptom is dizziness).&lt;br&gt;</td>
</tr>
</tbody>
</table>
| If YES, then diagnose MIGRAINOUS VERTIGO. IF NO, no diagnosis of migraineous vertigo. | Migrainous vertigo is diagnosed when the patient proceeds through the entire interview, and answers "YES" to question 7.<br>Patients whose responses cause a "STOP" signal at any point during the interview probably do not have migraineous vertigo.
IN THE PATIENT WITH REPEATED ATTACKS OF VERTIGO

Conclusions and take home messages

– always do a positional test
– learn to do the particle repositioning manoeuvre
– always order an audiogram.
– try migraine treatment (in selected cases)

• Forget about vertebrobasilar insufficiency as a cause of isolated vertigo
• if attacks are longer than a minute or so think of Menére, vestibular neuritis, multiple sclerosis, cerebellar infarction etc.
• Recurrent vertigo and dizziness frequently triggers fear, anxiety, panic, somatisation or depression
APPENDIX
Meniere

- Prodrome: fullness or blocked sensation in one ear
- Followed by ininnitus, decrease in hearing
- Followed by vertigo. (The vertigo typically lasts minutes to hours but may last as long as several days).
- Nausea, vomiting, diarrhea, pallor, and sweating usually are associated with an acute attack.
- Following an acute episode, hearing may return to normal. After multiple episodes, hearing can decrease
Meniere

- Headache and gait unsteadiness may persist for several days after an acute attack.
- Recurrences are typical, but the frequency of recurrences is unpredictable.
- Patients with severe vertigo may have drop attacks known as Tumarkin crises.
- Ménière disease can be bilateral (up to one third of these patients).
Patient with a history of Menére disease

• „I get a strange, tickly feeling in my right ear ... then my ear starts to get that full feeling ... then the spinning starts ... mild at first - probably more severe tonight. I'll be spending time in bed soon”.
ACUTE VESTIBULAR NEURITIS

- Patient can stand without support with the eyes open
- “But rotates toward the side of the lesion when trying to march on the spot with the eyes closed called a positive Fukuda or Unterberger test”
ACUTE VESTIBULAR NEURITIS

- Sudden, spontaneous, isolated, unilateral, total, or subtotal loss of peripheral *vestibular* function
- Usually there is antecedent viral infection in the history
- The nystagmus is always strictly unidirectional: slow phases towards the severely affected ear (may be suppressed by visual fixation)
- There is a horizontal-torsional spontaneous nystagmus quick phases towards the unaffected ear
Patient with RECURRENT SPONTANEOUS VERTIGO each lasting an hour or more

- most likely has either Menière's disease
- or migraine.
Vestibular ocular reflexes

The vestibulo-ocular reflex (VOR) serves a very specific function, to stabilise gaze in space during head movements. The VOR is what allows us to see clearly when we walk, turn our heads, or look out of the window while in a car. It does so by generating slow phase eye movements of an almost equal velocity, but opposite in direction, to head movement. This is achieved by a three neurone, short latency reflex: a Scarpa ganglion neurone, a *vestibular* nucleus neurone, and an oculomotor nuclear neurone (III, IV, or VI).
Cervico-ocular reflex

• Bronstein AM, Hood JD. Oscillopsia of peripheral **vestibular** origin. Central and cervical compensatory mechanisms. *Acta Otolaryngol* 1987;**104**:307–14.[Medline]
vertigo on the right side,

- It may be useful to start testing for benign paroxysmal positional vertigo on the right side, unless the history clearly points to affection of the left labyrinth; because benign paroxysmal positional vertigo affects the right labyrinth 1.4 times more often than the left side, possibly due to the habit of most patients to sleep on the right side (von Brevern et al 2004b).
 „Psychiatric” dizziness
Furman et al Neurology, 1997:may:1161-65

• Organikus vestibularis érintettségben szenvedő betegekben szignifikánsan gyakrabban pozitívak a pszichometriai tesztek, magasabb a (kis)psychiatriai morbiditás (pánik, depresszió, agoraphobia, kényszer)

• Pánikos, agoraphobias betegekben is szignifikánsan gyakrabban kórosak az otoneurológiai leletek

• Schizophren betegekben szignifikánsan gyakrabban kórosak az otoneurológiai leletek

• Schizophren betegek érzékenyebbek tengeribetegség (motion sickness) iránt
As the combination of minor physical and psychiatric disorder is known to be unusually persistent and handicapping, treatment programmes must be provided for this prevalent syndrome, perhaps by a partnership between primary care and neuro-otological and psychiatric hospital outpatient clinics with experience and expertise in the diagnosis and management of dizziness and psychiatric disturbance.

(J Neurol Neurosurg Psychiatry 1998;65:679-684)