Vertigo and Dizziness
causes, diagnostics, therapy

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Definition

„Vertigo is total or partial loss of spatial orientation, a rotation feeling of the surroundings”  
(Révész)

„Vertigo is a discrepancy between objective and subjective spatial relations”  
(Horányi)

An illusorically feeling of movement of the body or the surroundings
Development of vertigo

Vestibular – Optical - Somatosensory conflicting afferent information

\[ \downarrow \]

\textit{Efferent}

- Oculomotor system $\Rightarrow$ VOR $\Rightarrow$ (nystagmus)
- Spinal cord $\Rightarrow$ musculature $\Rightarrow$ balance $\Rightarrow$ (ataxia)
- Parietotemp. cortex $\Rightarrow$ spatial orientation $\Rightarrow$ (vertigo)
- Vegetative system $\Rightarrow$ (vomitus)
Types of vertigo

Vertigo
• A sense of feeling the environment moving when it does not. Persists in all positions. Aggravated by head movement.

Dysequilibrium
• A feeling of unsteadiness or insecurity without rotation. Standing and walking are difficult.

Light headedness
• Swimming, floating, giddy or swaying sensation in the head or of the room.
Symptoms of vertigo of peripheral origin

Cause: lesion of the labyrinth and vestibular nerve

- harmonic vestibular syndrome
- consistent direction of tilt, past pointing, blind walking and slow component of the nystagmus
- nystagmus: horizontal or horisonto-rotatory, never vertical
- direction of nystagmus is independent of gaze direction (I. II. III. grade nystagmus)
- symptoms intensified by change of head position
- frequently intensive vegetative symptoms (vomiting, sweating, paleness)
- mortal fear can develop
- decreased vestibular function on lesion side
Vertigo of central origin

Cause: lesion of vestibular nucleus other CNS lesion
- **dysharmonic vestibular syndrome** (can be harmonic as well!)
- direction of nystagmus can change with gaze direction
- nystagmus is not suppressed by visual fixation
- nystagmus can be up- or downbeat or rotatory, or even dissociated
- dizzy feeling not severe and mostly not rotatory
- symptoms not intensified by change of head position
- vegetative symptoms less severe

- other neurol. symptoms: double vision, dysarthric speech, dysphagia, numbness, paresis, ataxia etc.
History

- **Type of vertigo**
  - rotatory / postural / atypical

- **Duration**
  - seconds / minutes / hours / continuous / recurrent

- **Trigger**
  - no / walking / head rotation / certain head positions / coughing / pressing / loud sounds / life situations

- **Accompanying symptoms**
  - hypacusis / tinnitus / double vision / ataxia / nystagmus / oscillops / brainstem or cerebellar symptoms / headache
## Diff. Dg. by symptom duration

<table>
<thead>
<tr>
<th>Time</th>
<th>Peripheral</th>
<th>Central</th>
</tr>
</thead>
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<tr>
<td>Seconds</td>
<td>BPPV</td>
<td>VBI-TIA, epilepsy aura</td>
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<tr>
<td>Minutes</td>
<td>labyrinth fistule</td>
<td>VBI-TIA, migraine aura</td>
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<tr>
<td>Hours</td>
<td>Menière disease</td>
<td>basilar migraine</td>
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<tr>
<td>Days</td>
<td>vestibular neuronitis, labyrinthitis</td>
<td>VB stroke</td>
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<tr>
<td>Weeks, months</td>
<td>vestibular Schwannoma, ototoxicity</td>
<td>multiple sclerosis, cerebellar degeneration</td>
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Special examination techniques

- **Eye movements**
  - saccadic, smooth pursuit

- **Nystagmus**
  - spontaneous, gaze evoked, hyperventilation
  - Frenzel glasses, to eliminate fixation

- **Halmágyi-Curthoys manoeuvre (head impulse test)**
  - horizontal VOR
  - unilateral labyrinth lesion $\rightarrow$ catch-up saccad

- **Dix-Hallpike manoeuvre**
  - positional nystagmus, BPPV

- **Statokinetic tests**
  - Romberg
  - blind walking, star walking
  - Bárány test
Dix-Hallpike manoeuvre
Special examination techniques

- **Labyrinth stimulating tests**
  - head shaking test (30 sec) – unilateral lesion
  - vibration induced nystagmus (60 Hz) – unilateral lesion
  - caloric test – gold standard in unilateral lesion
  - rotational test

- **Pressure change**
  - Politzer balloon,
  - tragus compression, Valsalva manoeuvre

- **Optokinetic nystagmus**
  - poorly cooperating patients

- **Subjective visual vertical**
  - tilt towards the lesion by 10-30 ° (norm: 0° ± 2,5°)

- **Hyperventilation**
  - cerebellar lesion – downbeat nystagmus
  - vestibular paroxysmia
Role of CT and MR

- **Brain CT or MRI is indicated if suspicion of intracranial pathology**
- **High resolution pyramid bone CT:**
  - 0.6 mm slices, resolution: 0.4x0.4x0.4 mm
  - Indication:
    - os petrosum fracture
    - superior canal dehiscence syndrome
    - labyrinth ossification: Cogan sy., otosclerosis
- **Os petrosum and posterior fossa MR:**
  - neurovascular compression
  - Cogan syndrome, labyrinthitis, cochlear inflammation
**Most frequent causes** (Brandt)

- **BPPV** (*otolith*) 18.3%
- **Phobic postural vertigo** (*PPV*) 15.9%
- **Central vestibular vertigo** 13.5%
- **Vestibular / basilar migraine** 9.6%
- **Vestibular neuronitis** (*viral*) 7.9%
- **Menière disease** (*hydrops*) 7.8%
- **Bilateral vestibulopathy** 3.6%
- **Psychogenic vertigo** (*except PPV*) 3.6%
- **Vestibular paroxysmia** (*neurovasc. compr*) 2.9%
- **Perilymphatic fistule** (*incl. Posttraumatic*) 0.4%
- **Other** 12.3%
- **Unknown** 4.2%
Further peripheric causes

- Labirynthitis (cochlea r involvement)
- Commotion of the labyrinth, pyramid fracture
- Cochlear infarct (a. labyrinthi occlusion)
- Alternobaric vertigo (alternobaric)
- Posttraumatic otolith vertigo
- Herpes zoster oticus
- Vestibulotoxic agents
  - aminoglicosides, salicilic acid, antiepileptics
Most frequent central causes

- Brainstem stroke or TIA
- Multiple Sclerosis
- Basilar / vestibular migraine
- Tumors of the posterior fossa
- Syringobulbia
- Arnold - Chiari malformation
- Cerebellar atrophy, degeneration
- Temporal lobe epilepsy
Systematic causes

- Hypertension
- Presyncope states, eg. orthostatic hypotension
- Carotid sinus hyperaesthesia, vasovagal attacks
- Aritmias
- Hyperventilation
- Hypo – hyperglycaemia
- Aortic or mitral valve stenosis
- AMI
- Obstructive cardiomyopathy
- Aortic dissection
- Pulmonary emboli
- Cardiac insufficiency
- Anaemia
- Hyperviscosity syndrome
- Addison disease
- Salt wasting
- Intoxication
General therapy

Symptomatic, during acute vestibular attack

- vestibular suppressants
- Antiemetics

Balance training, vestibular rehabilitation

- enhancing central compensation

Surgical (rare)

- tumors, cavernomas
- neurovascular compression
- perilymphatic fistule
- rarely Meniére, BPPV

Psychological, psychiatric

- PPV, acrophobia
Symptomatic therapy

Vestibularis suppressants:
- benzodiazepines
- *dimenhydrinat;* promethazine
- hydroxyzine
- cinnarizine; flunarizine

Antiemetics:
- Anti-dopaminergic: haloperidol, metoclopramide, domperidon
- Anticholinergic-antihistamine: *dimenhydrinat,* promethazine, ondansetron
Vertigo syndromes of peripheral cause
BPPV

Benign paroxysmal positional vertigo

- Bárány 1921
- >70 yrs 1/3
- Max 30-60 seconds
- Certain head positions provoke the attacks
- Nystagmus appears after latency, fixed direction, crescendo- decrescendo
- Cause: canalolithiasis: most frequently posterior semicircular canal
- No spontaneous nystagmus, no hearing loss, no caloric test abnormality
- 90% idiopathic, some posttraumatic, post neuronitis, long term bedridden state
- 10-20% bilateral
BPPV therapy

- Drugs not help!!!
- Repositional / liberating manoeuvres
  (80-95 % success)

Semont
PPV phobic postural vertigo

- 2. most frequent cause of dizziness
- *Age:* 2. and 5. decades
- Instability feeling in upright posture
- Fear attacks of falling, stumbling, lurching with anxiety and vegetative symptoms
- Small amount of alcohol, sports: improvement
- Frequently in *certain situations* (crowd, bridge, driving, etc.)
- Escalates, avoiding behaviour develops
PPV phobic postural vertigo

- **Personality:** obsessive-compulsive or perfectionist

- **Physical examination:** negative!

- **Therapy:**
  - informing, desensitisation, behaviour therapy
  - antidepressants (SSRI, TCA)
Vestibular neuritis

- Harmonic vestibular syndrome
- Complete vestibular function recovery only in 40%!!
- Later BPPV or PPV can occur

**Therapy:**
- Vestibular suppressants
- Metilprednisolone: within 3 days, 100 mg/day, tapering every 3 days by 20 mg, up to 3 weeks!?; *much better residual vestibular function!!*
- Circulation enhancing infusions are ineffective!!
- Vestibular training
Menière disease

- **Tipical attack:**
  - Harmonic syndrome *direction change during attack!!!*
  - *tinnitus, hearing loss, fullness in the ear*
  - Hours (> 20 min), max. 12 hours
  - Excitation, later vestibular loss
  - Progressive hearing and *vestibular function* loss

- 4.-6. decades male dominance

- **Vestibular drop attacks Tumarkin’s otolith crisis**

- Therapy:
  - Vestib. supressants
  - Profilaxis: **Betahistin 3 x 40-48 mg for 6-12 months!**
  - If ineffective, *hydrochlorothiazide, triamteren*
  - Rarely intratympanal gentamycin injections. Surgery ineffective.
Bilateral vestibulopathy

- Oscillopsy during head movement and walking
- Insecurity of walking in darkness and uneven surface
- Disturbance of spatial orientation and memory

- Loss of VOR, Halmágyi test positive bilaterally
- **Romberg** extremely affected

- Hearing loss can be present
Bilateral vestibulopathy

- **Aetiology:**
  - ototoxikus medications: aminoglycoside, aspirin, diuretics, chemotherapeutics
  - cerebellar degeneration, MSA, SCA
  - meningitis, labyrinthitis: bacterial, TBC, HIV
  - tumors: neurofibromatosis type II.
  - autoimmune: Cogan, Bechet, SLE, RA, PAN, giant cellarteritis
  - neuropathies
  - bilateral Menière
  - Paget, bilat. Pyramid fracture

- **Therapy:** prevention immununsuppressants
Vestibular paroxysmia

- Short lasting vertigo or postural imbalance attacks lasting for seconds, max. minutes with severe rotatory nystagmus
- Tinnitus, hypacusis can be present
- Vestibular and cochlear deficit can develop
- *Trigger:* certain head position, hyperventilation
- *Carbamazepine* reduces or stops attacks
- No brainstem signs
- Sometimes facial nerve excitation
- 5.-7. decades, male predominance
Vestibular paroxysmia

• **Aetiology:**
  – neurovascular cross-compression
  – segmental, pressure induced demyelinisation of the central (oligodendroglia) myelin cover, *spontaneous discharges*
  – **AICA** is the most frequent cause
  – arachnoidal cyst, aneurysm, vascular malformation
Vestibular paroxysmia

- **Therapy:** carbamazepine 200-600 mg/die
  - rapid effect, diagnostic
  - oxcarbazepine, gabapentin, valproat, phenytoin

- Surgical decompression should be avoided:
  - Hearing loss, stroke, side?, 50-60% success

- **Diff dx:**
  - BPPV, migraine, PPV, episodic vertebral artery occlusion, brainstem paroxysms (SM)
Perilymphatic fistula

- **Attacks lasting seconds-days:**
  - rotatory or postural vertigo
  - oscillopsia, usually vertical-rotatory nystagmus
  - standing, walking imbalance
  - hearing loss can be present

- **Trigger:** pressure change
  - coughing, sneezing, Valsalva, loud sounds, bending over, flights, extreme heights

- **History:**
  - barotrauma, head trauma, ear trauma
Perilymphatic fistula

• *Provocating tests:*
  – Valsalva manoeuvre, tragus compression, Politzer balloon

• *Exam:* HR-CT, tympanoscopy

• *Cause:*
  – dehiscence of superior semicircular canal
  – fistula between perilymphatic space and middle ear at the oval- or round window
  – Intracranial or middle ear pressure reaches the labyrinth
Perilymphatic fistula

• **Conservative therapy:**
  – 1-3 weeks of **bedrest**
  – laxatives, moderate physical exercises for weeks
  – almost always successful

• **Surgical therapy:**
  • Closing of the fistula (ENT, neurosurgeon)
  • success rate 70%

• **Diff. dg:**
  • BPPV, PPV, Menière, v. paroxysmia, central cause
Vertigo syndromes of central origin
Basilar / vestibular migraine

• **Recurrent attacks:**
  – vertigo, ataxia, visual disturbance, other brainstem signs
  – occipital **headache**, nausea, vomitus
  – altered consciousness, mood change

• **Only vertigo or hearing loss:**
  – vestibular migraine
  – 75% of the cases, hard to recognize!

• **Duration:** seconds - days
Basilar / vestibular migraine

- **Therapy:**
  - as in normal migraine
  - Antiemetics, NSAIDs
  - triptanes: carefully, danger of VBI!!
  - profilactic: beta blockers, valproic acid

- **Diff dg:**
  - TIA, vertebral artery dissection, basilar artery occlusion
Brainstem ischemia

PICA area
Wallenberg syndrome

Multiple Sclerosis
Brainstem and cerebellar metastases
Syringobulbia-myelia
Arnold-Chiari malformation
Other causes

- Kinetosis
- Height vertigo
- Sensory deprivation (neuropathy, visual loss)
- Cervicogenic???
- Psychiatric disorder (panic, acrophobia)
- Familiar Episodic Ataxia Type1-2
- Autoimmune (Cogan, Bechet, Wegener, SLE, vasculitis, RA, APL)