Imaging vestibular function and disorders

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Disclosure

None
Learning objectives

Imaging of the vestibular system

(A) in healthy volunteers
(B) in patients with vestibular disorders

1. of the labyrinth
2. of vestibular structures in the brainstem
3. of areas within the vestibular cortical network
1. Labyrinth
1A. Inner ear/ labyrinth

ivMRI of the inner ear bony structures of both ears
(3T, 4h after iv)

Dice score of 89% for the right and 86% for the left ear

1B. Semiquantitative analysis of ELS with 3D reconstruction 4h after Gadolinium iv

Kirsch et al. 2019 in prep.
Significant Overlap in VM and MD

VM: - Thalamic dysfunction of central vestibular and multisensory networks
- ELH in 20% (older classification; grade I-II) to about 68% (newer; grade 0-I), more symmetric; ELS plasticity dependent on disease activity

MD: - ELH in all patients (100%) with higher grading (I-II) and asymmetry
- 3 rare single nucleotide variants in PRKCB, DPT and SEMA3D linked with familial Meniere disease

ELH: common final section of different pathophysiology?
2. Vestibular structures in the brainstem
Vestibular brainstem structures

**Ipsilateral**
- Vestibular nerve
- Vestibular nucleus (VN):
  - medial VN
  - superior VN
- Paramedian thalamus
- Parieto-insular vestibular cortex (PIVC)/Operculum

**Contralateral**
- Medial longitudinal fascicle (MLF)
- Interstitial nucleus of Cajal (INC)
- Posterolateral thalamus:
  - Vim, VPL
- PIVC/Operculum
3. Vestibular cortical network
3A. Vestibular cortex areas in humans from activation studies: PET & fMRI

Dieterich & Brandt, Brain 2008
3 determinants influence the lateralization of vestibular function in the two hemispheres (PET during calorics):

1. Handedness
2. Side of stimulated ear
3. Direction of nystagmus
References


