Imaging in Cochlear implantation

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1.OTOLARYNGOLOGICKÁ KLINIKA LFUK, FNsP A SZU

Imaging in Cochlear implantation Topics

- Protocol for imaging
- Structures to evaluate
- CT vs. MRI
- Postimplantation imaging
- Special findings

Imaging in Cochlear implantation Protocol

- CT in all cases (adults)
- CT in selected cases (children)
- MRI in all cases (children)
- MRI in selected cases (adults)
- Early postoperative imaging (electrode position)
  - Conventional x-ray
  - CT
- Delayed postoperative imaging (device failure)

Imaging in Cochlear implantation Protocol MDCT

- **MDCT technique**
- High resolution thin – section bone window level setting
- Axial plane with the option of coronal or/and sagittal reconstructions /3D reconstructions/
- Slice collimation 0,5 – 0,6mm
- Reconstructed slice thickness 0,5 – 1mm
- FVO (field of view) 180 – 200mm
- Matrix 512 x 512

Protocol MRI
Head coil

- **Brain**
- Axial T1 tse, 6mm
- Axial FLAIR, 6mm
- Sagittal T2 tse, 6mm

Petrous bone

- Axial 2D T2 tse, 2mm
- Coronal 2D T2 tse, 2mm
- Sagittal oblique* 2D
- Axial 3D T2 tse, 0,6mm
  T2 tse, 2mm

- *Sagittal oblique two-dimensional fast spin echo T2-weighted through the internal auditory canal perpendicular to the its long axis.

Imaging in Cochlear implantation

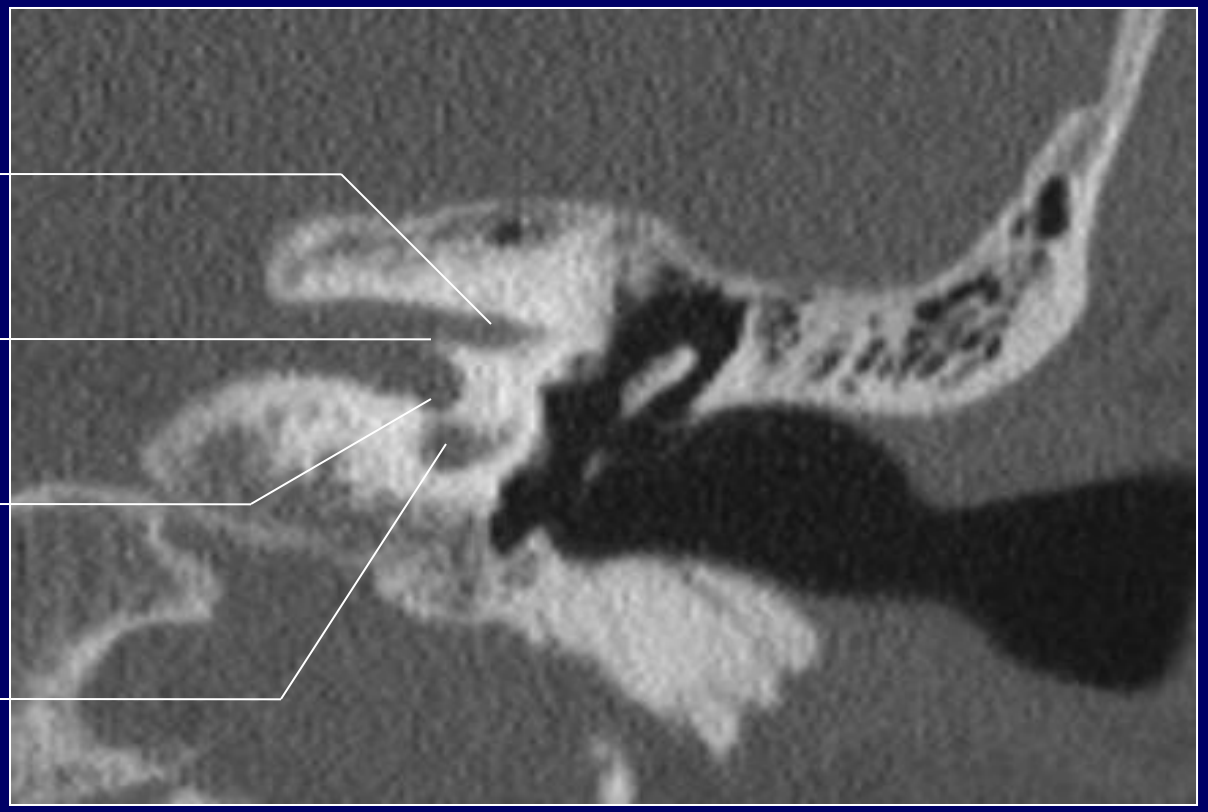
CT

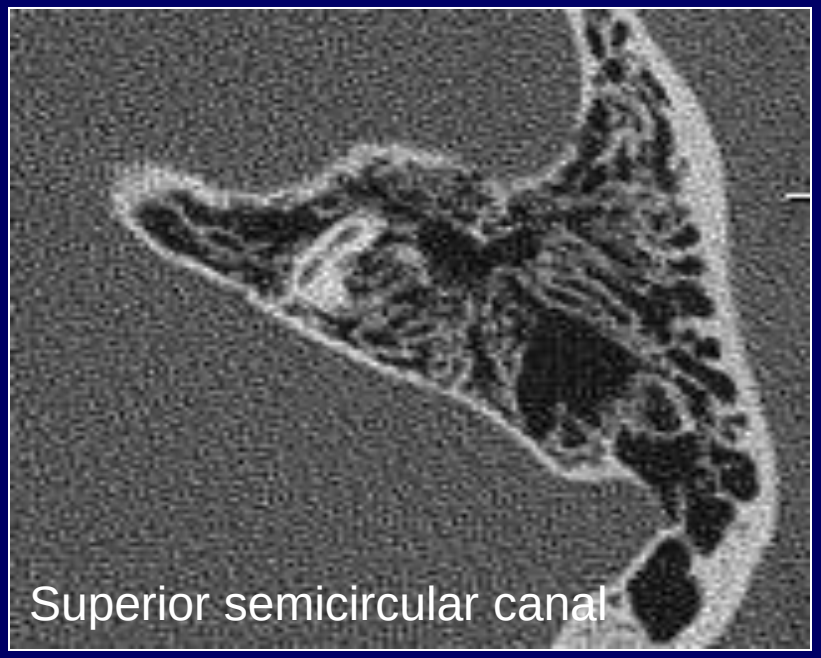
- Ductus cochlearis
- Vestibulum
- Round window
- MAI
- Cochlear aperture
- Semicircular cannals
- Aquaeductus
- Surgical landmarks
  - Facial canal
  - Sulcus sinus sigmoideus
  - Jugular bulb
  - Mastoid pneumatisation

MRI

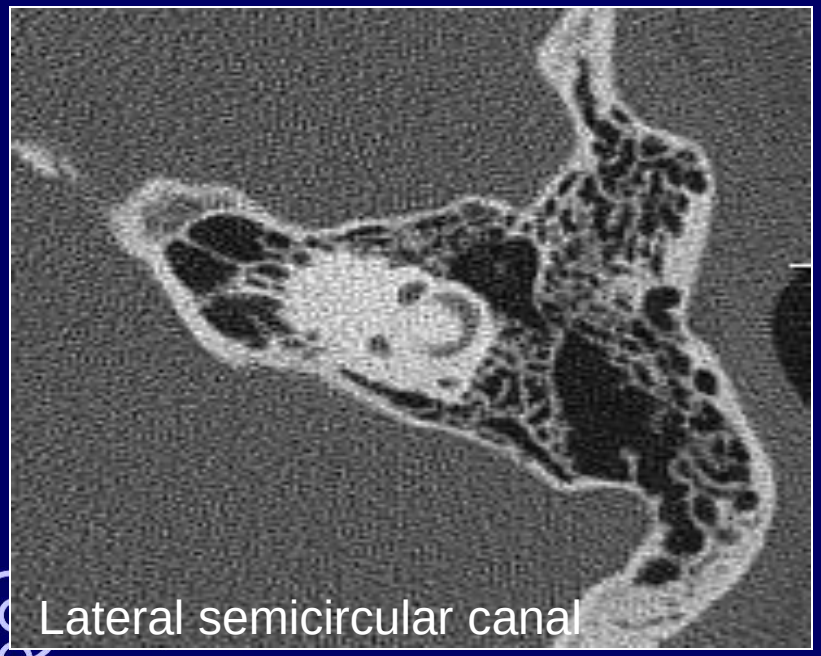
- Liquid signal from cochlea
- Liquid signal from semicircular canals
- N VIII
  - In PC cistern
  - In brainstem

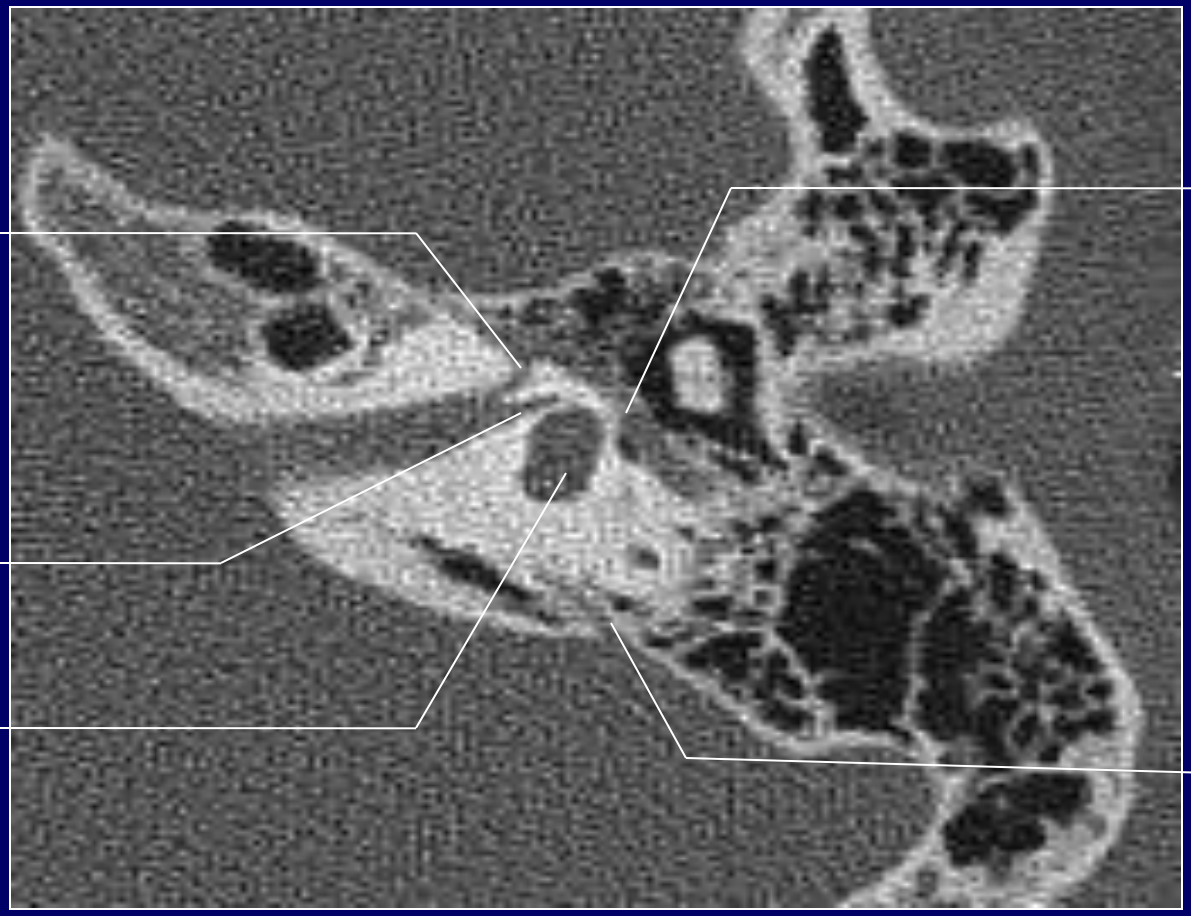

Promontorium
Round
windov


Labyrinthine segment, CN7
Crista transversa
Cochlear aperture
Basal turn cochlea


Superior semicircular canal


Posterior semicircular canal


Lateral semicircular canal



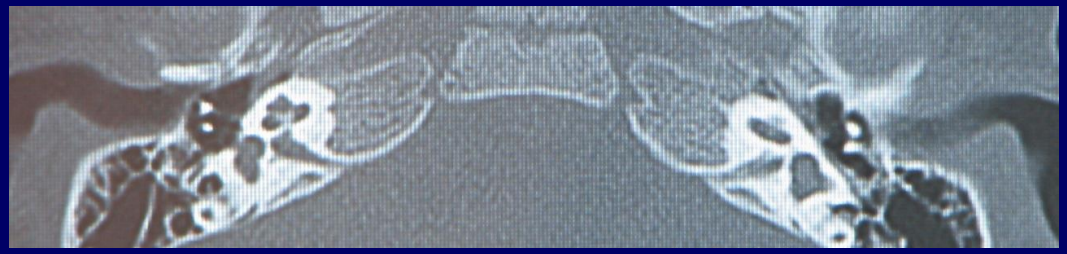
Labyrinthine segment, CN7

Cribriform plate foramen

vestibulum

Tympanic segment, CN7

Vestibular aqueduct



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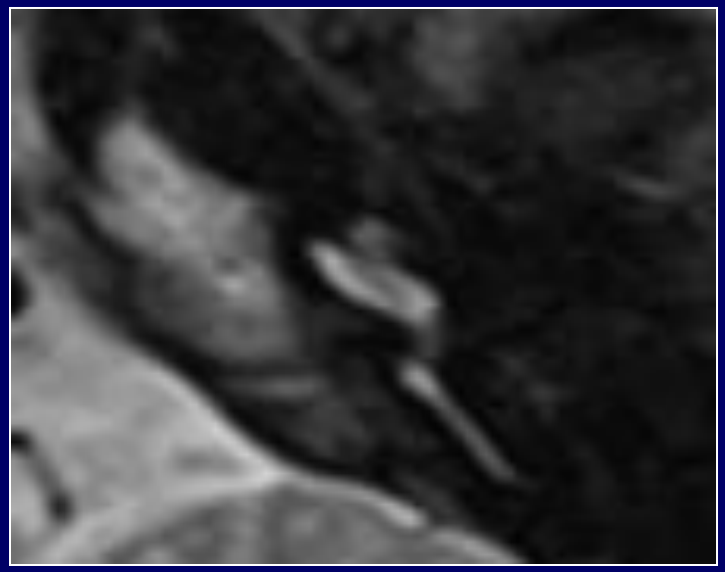
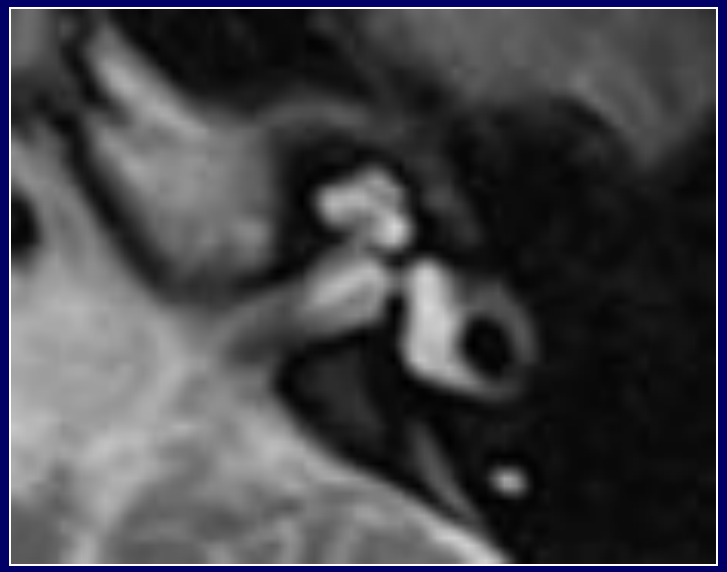
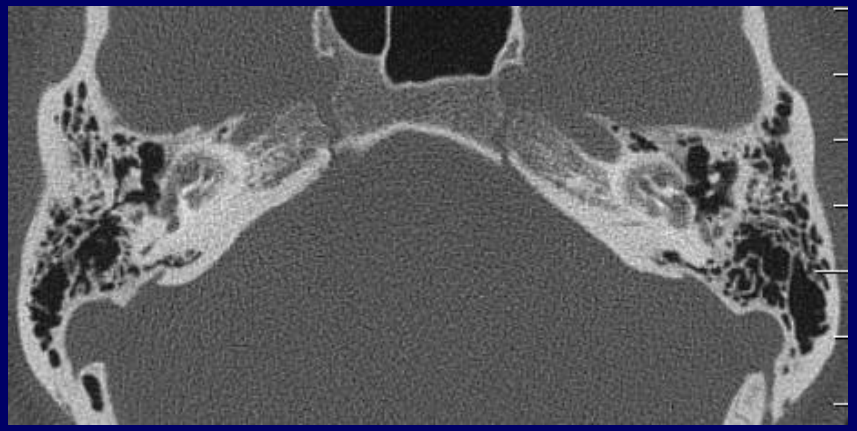
Axial high – resolution, thin - section T2 W images

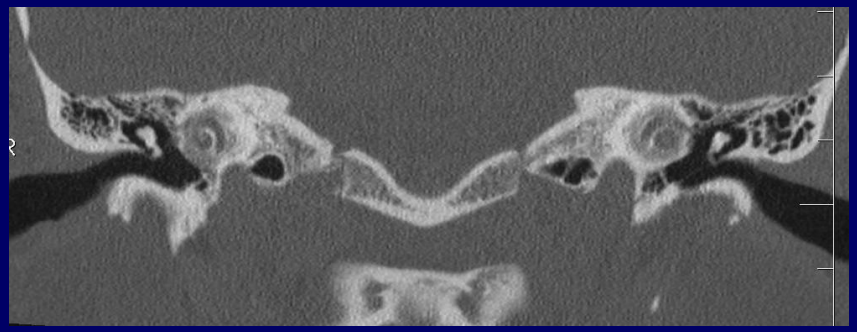


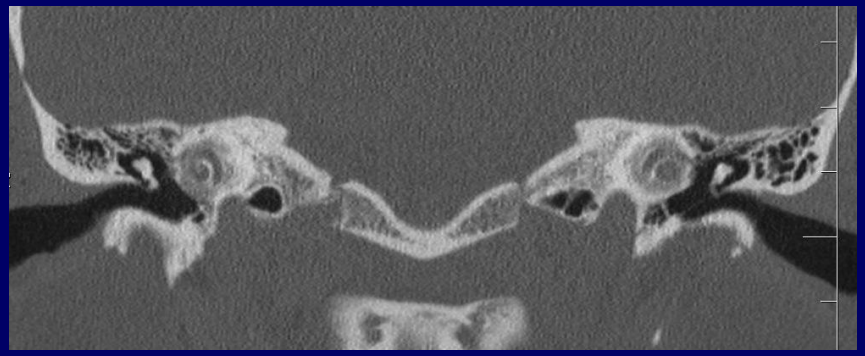


Lamina spiralis ossea

Cochlear nerve







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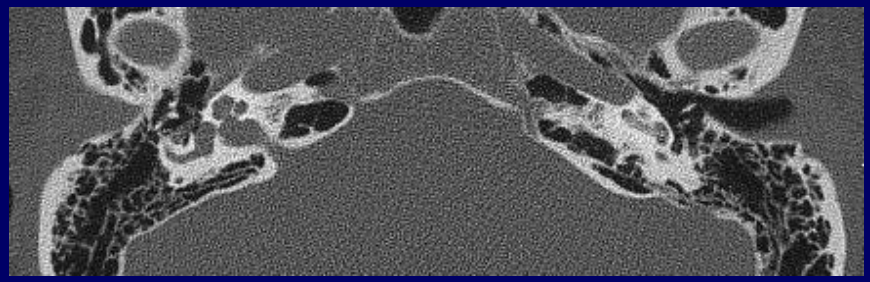
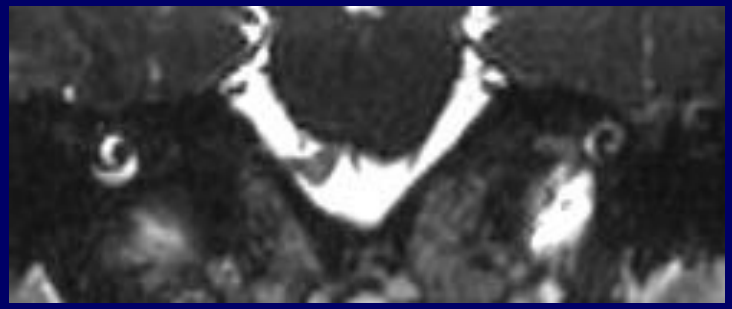
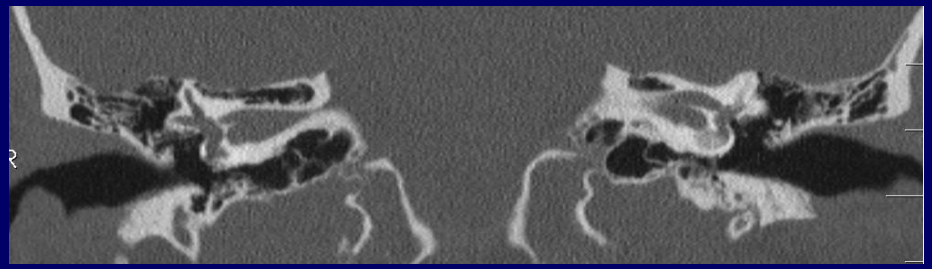
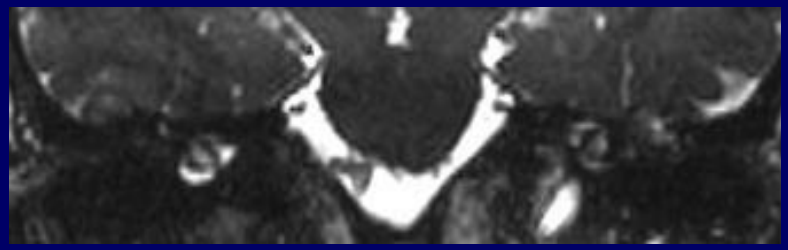
Otosclerosis









Unilateral ossification (left),
T2 signal from ossified cochlea

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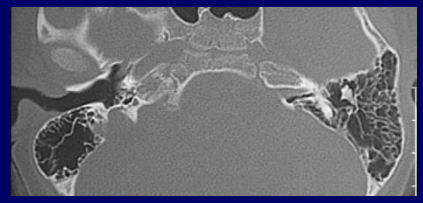
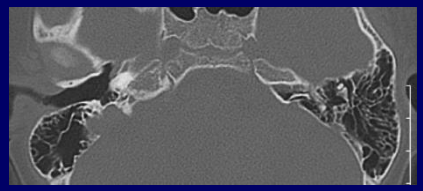
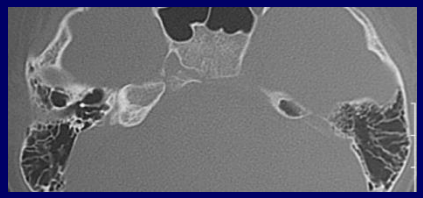
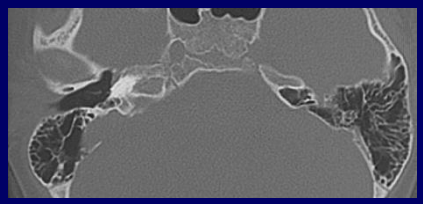
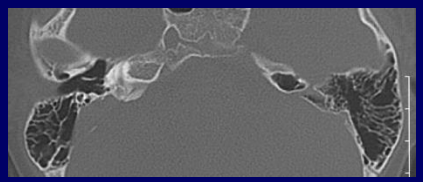
Aplasia of bony labyrinth
Girl 3y

Aplasia of the pyramid
Boy 15y





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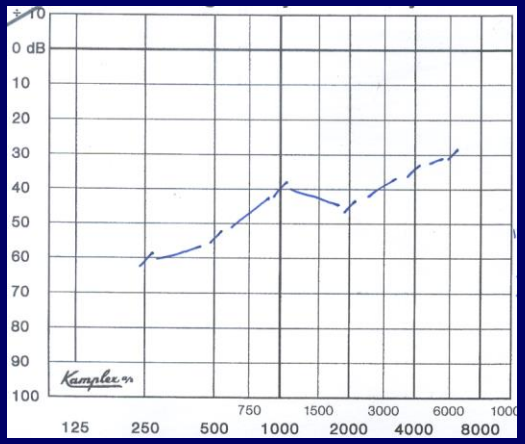
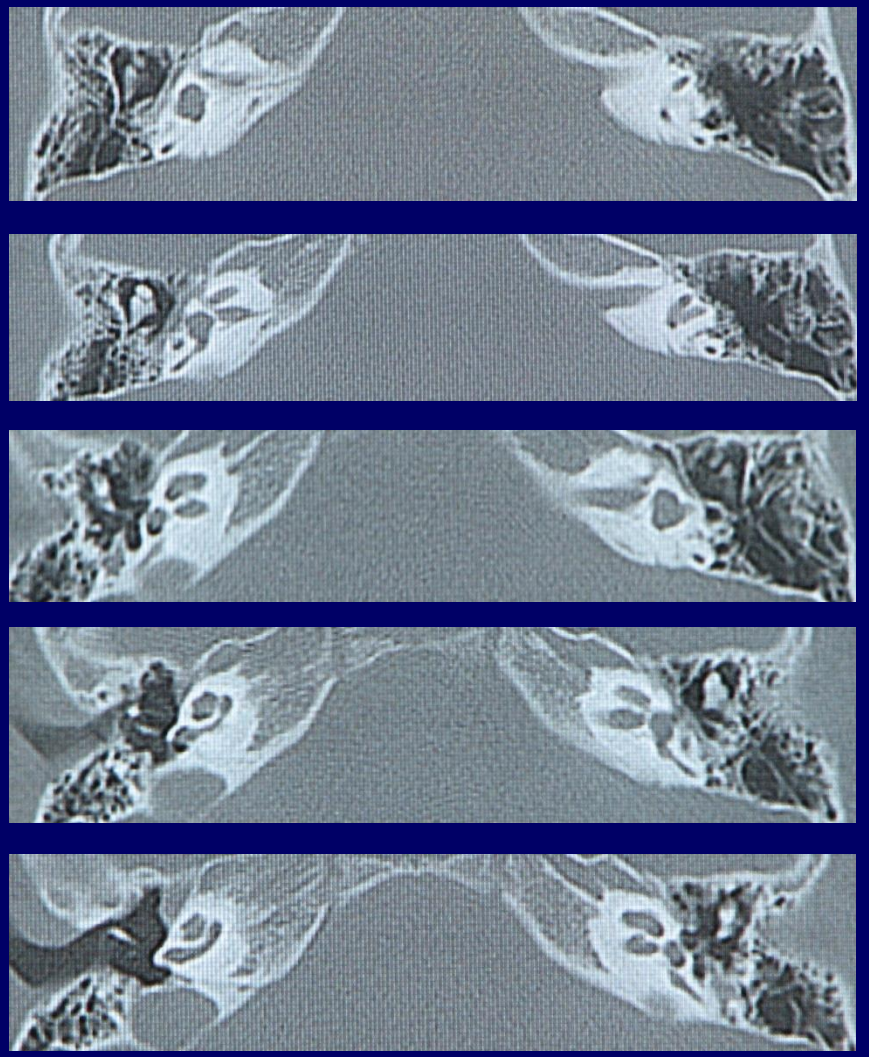
Lateral semicircular canal aplasia (5y,m)

CAP	Evaluation of spontanneous speech	Scale of speech understanding
3/8 Identification of environmental sounds	2/9 Uses several words	2/6 Partially undestandable





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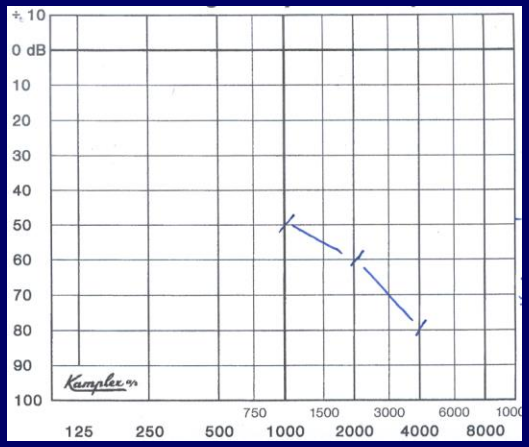
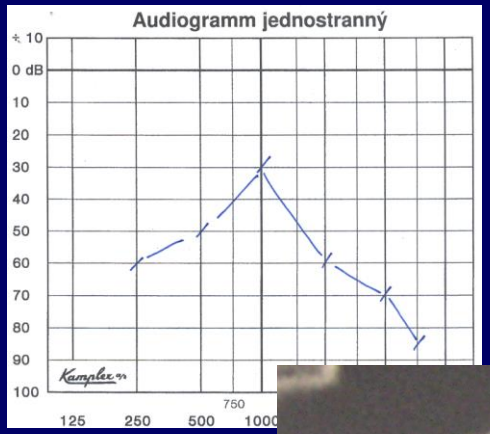
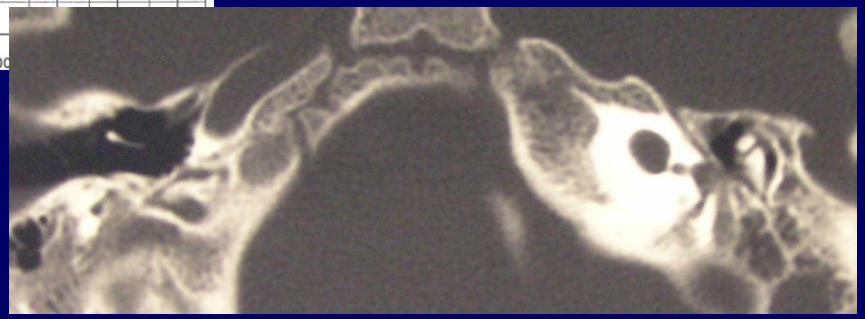
Common cavity (6y, f, surgery at 3y)

CAP	Evaluation of spontanneous speech	Scale of speech understanding
1/8 Perception of environmental sounds	1/9 Sense vocalisation	0/6 Non understandable speech

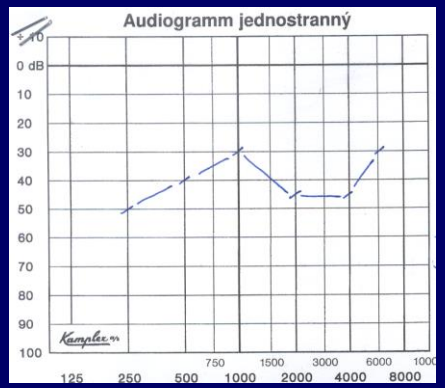


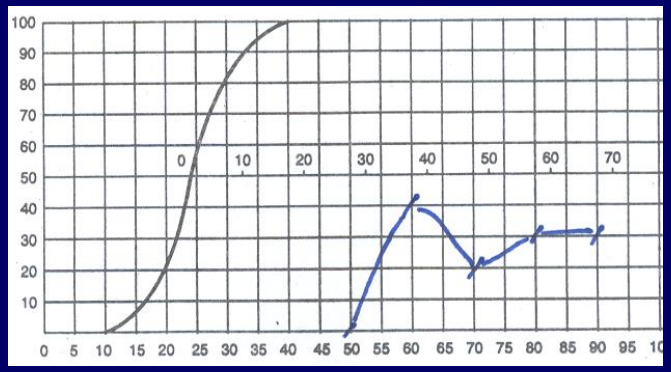


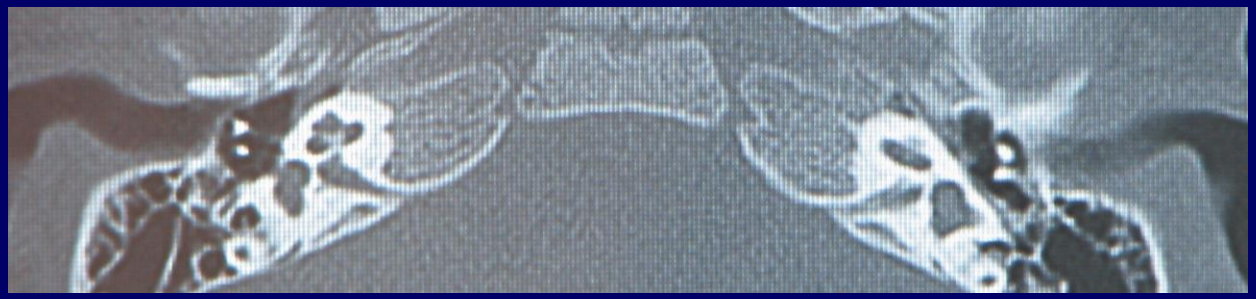


Narrow IAM (7y, f, surgery at 3y)

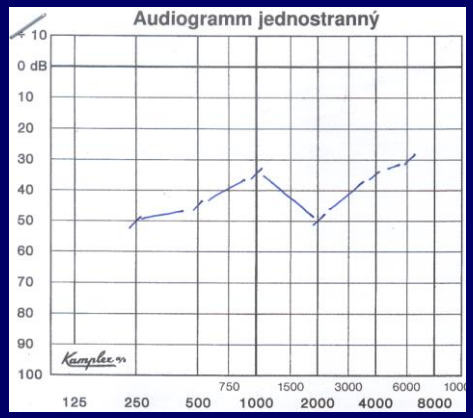
CAP	Evaluation of spontanneous speech	Scale of speech understanding
4/8 Discrimination of the speech sounds without lip reading	5/9 Three words sentences	3/6 Understandable to those who are experienced with communication to hard of hearing

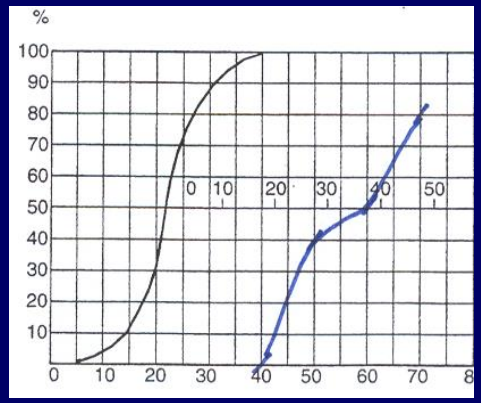






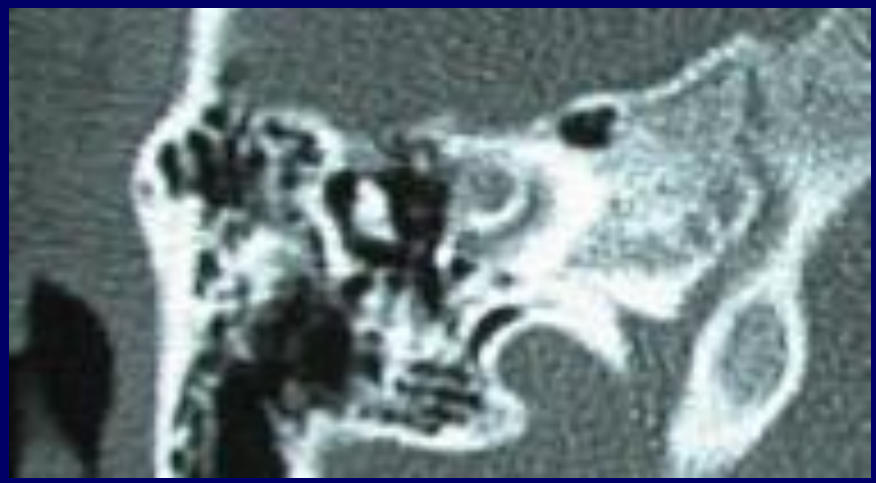
Obliteration of cochlea

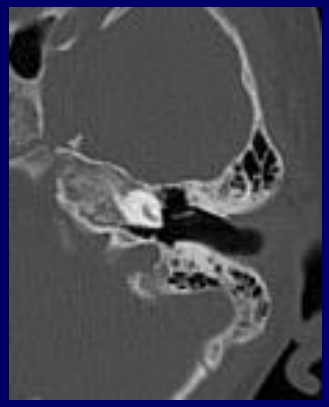
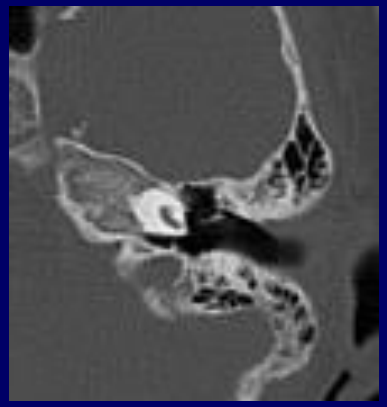
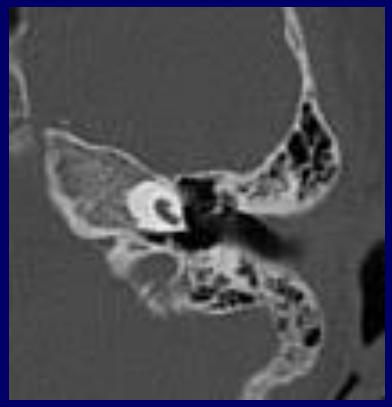
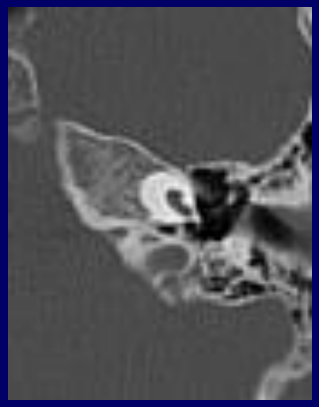


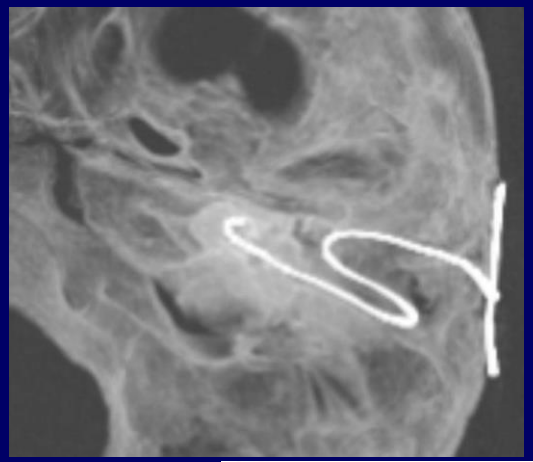


Female 38
Postlinguall deafnes from otosclerosis
Deaf for 5 years
CI in 2003, 33y
Nucleus CI 24 /split el.
Evaluation 5y after CI

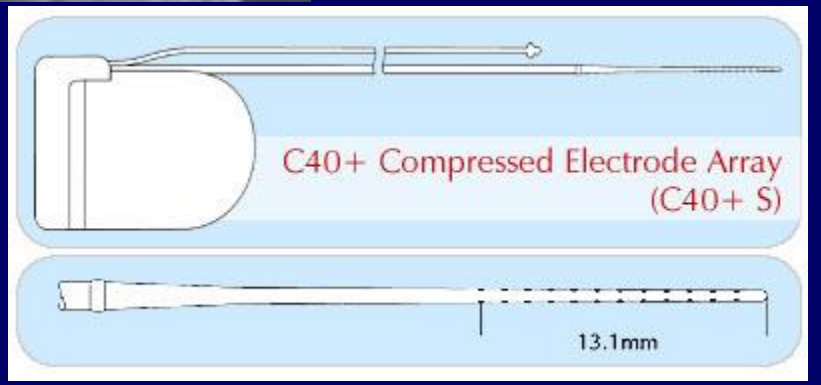
CAP 7
SA 60/40: 60%
Monosyllabic words:
60/40 20%



Cochlear malformation
Implantation to the basal turn



Algoritm in the pediatric CI imaging

- CT in selected children
  - Cochlear malformation
  - Narrow MAI
- MRI in all children
- Postoperatively
  - conventional x-ray
  - CT

Algoritm in the CI imaging in adults

- CT in all cases
- MRI in selected cases
  - Meningitis
  - Malformation
  - Otosclerosis
  - Ossification
  - Trauma
  - Narrow IAM
- Postoperative x-ray