PRESURGICAL NONINVASIVE EVALUATION OF EPILEPSY SURGERY

EPODES COURSE, BRNO

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Epilepsy surgery

• The surgical intervention in which the primary goal is to treat medically refractory epilepsy
  – Relieve from seizures
  – Decrease the AEDs and related side effects
  – Improve quality of life
• Almost 25-30% of epilepsy is difficult to control
  – App. 1/3 rd surgical candidates
Benefits of surgery

- freedom from seizures
- reducing AEDs
- better social life

Potential risks of surgery

- complications related to surgical intervention
- inadequate control of seizures
- seizure recurrence
Presurgical workup should address:

- Identification of the *epileptogenic zone*
- Impact of surgery on cognitive functions of the patient
- Impact of surgery on psychological state of the patient
Objective of resective surgery

Complete resection or disconnection of the "epileptogenic zone"

Epileptogenic zone: the area of cortex indispensable for the generation of clinical seizures. This aim should be achieved with the preservation of eloquent cortex.
**Seizure onset zone**, the cortical area from which the clinical seizures are generated-localized by EEG and ictal SPECT

**Irritative zone**, is the area capable of producing interictal spikes on EEG

**Symptomatogenic zone**, defined by ictal symptoms, which was produced when activated, ictal symptoms, stimulation

**Functional deficit zone**: Functionally abnormal zone in the interictal period, neuropsychological test, PET, SPECT, EEG
Steps of Epilepsy Surgery

1st step: selection of candidates
2nd step: presurgical evaluation
   1.phase: non-invasive
   2.phase: invasive
3rd step: surgery
4th step: post surgical follow-up
1st Step
Selection of Candidates for resective surgery

Surgically remediable syndromes

- Mesial temporal lobe epilepsy (HS)
- Well circumscribed lesions
- Hemispheric lesions
- Large destructive/atrophic lesions without severe deficits
2nd Step: Presurgical evaluation

Phase I (non-invasive)

- History, physical and neurological examination
- Electrophysiology
- Structural imaging
- Functional imaging
- Neuropsychology, psychiatry
Electrophysiology

- Interictal scalp EEG
- Ictal scalp EEG

Electroclinical recording of seizures with long term video-EEG using additional electrodes (sphenoidal, foramen ovale electrodes)
Phase I non-invasive investigations

Neuroimaging

Recommendations of the Commission of the ILAE on Neuroimaging

Determination of structural lesion

Hippocampal Sclerosis
Other sequences

- MRS (metabolism)
  NAA/Cr+Ch decrease $\rightarrow$ neuron loss

- fMRI (localisation of function)
**Interictal FDG-PET:** sensitivity ~70% in TLE, hipometabolizma ant. TL, talamus, bazal ganglia, frontal kortex, insula (NETWORK)
Interictal and ictal SPECT

**Ictal SPECT** high sensitivity;
interictal 0.44, postictal 0.75, ictal 0.97 (Devous 1998)

Interictal

Ictal

Subtraction

⇒ Determination of haemodynamic modification related to seizures
Neuropsychological Assessment

**GENERAL COGNITIVE EVALUATION**
- **WAIS**
- **HAND PREFERENCE**
  - Edinburgh hand preference
- **ATTENTION**
  - Digit span
  - Corsi blok test
- **FRONTAL FUNCTIONS**
  - “Stroop” test
  - “Wisconsin Card sorting test”
  - Verbal fluency
- **MEMORY**
  - WMS “Sözel hikaye” alt testi
  - SBST(Sözel Bellek Süreçleri Testi)
  - WMS “vizüel reproduksiyon” alt testi
- **LANGUAGE**
  - BDAE “cookie thieves” card
  - BNT
  - Token test
- **VISIOSPATIAL FUNCTIONS**
  - BFR(Benton facial recognition test)
  - BLO(Benton judgement line orientation test)
Pschiatric Evaluation

- Interview
- Different scales for depression, anxiety, personality etc (if necessary)
Presurgical evaluation

Phase I non-invasive investigations

Electro clinical structural functional correlation

DECISION

- contrendication
- surgery
- Phase II invasive investigations

Lesionectomy or Standard anterior temporal lobectomy
Presurgical evaluation

Phase II: invasive investigation

- Subdural-epidural electrodes
- Depth electrodes
- Functional mapping
- IAT (Intracarotid Amital Test-WADA)
History, physical and neurological exam
EEG monitorization, CT, MRI, PET, SPECT
Neuropsychological evaluation

Phase I

Concordant localization
- Neoplastic or vascular pathology
  - Resection until normal substrate

Discordant localization
- Major hemispheric abnormality
  - Functional hemispherectomy
- Invaziv Monitorization (subdural grid, strip, depth electrodes)
  - Multifocal or nonlocalized
    - No cortical resection
  - Localized
    - Resection according to ictal recordings

Developmental or undetermined abnormality
