How do we evaluate patients before epilepsy surgery?

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MAHIDOL UNIVERSITY
Wisdom of the Land

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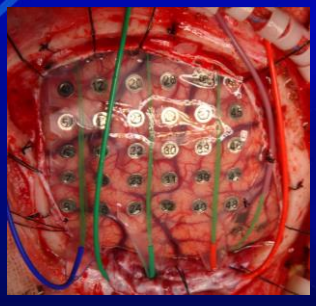

- Under limited resources
- You can do it
- You can help patients

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Topics

- Who?
- Why?
- **How?**
- Outcome: Benefits & Complications

Intractable Epilepsy

- Recurrent unprovoked seizures occur in 1-2% of children
- 20-40% of children with epilepsy not respond to optimal medical treatment

Epilepsy Surgery; Who?

Epilepsia, 51(6):1069–1077, 2010
doi: 10.1111/j.1528-1167.2009.02397.x

SPECIAL REPORT

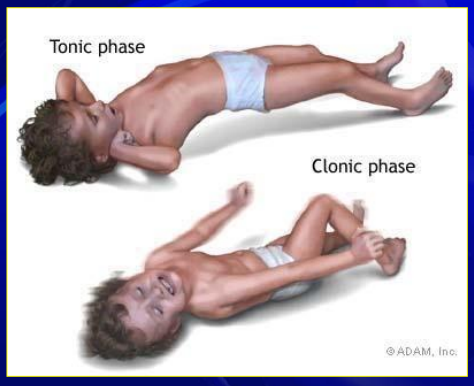
Definition of drug resistant epilepsy: Consensus proposal by the ad hoc Task Force of the ILAE Commission on Therapeutic Strategies

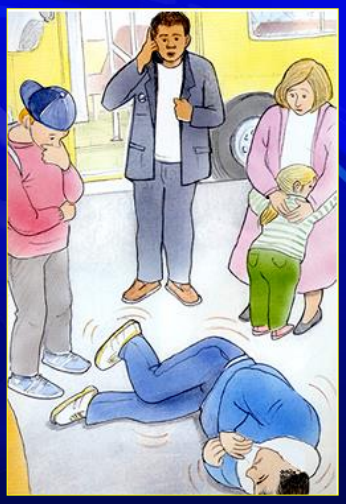
*[1]Patrick Kwan, †Alexis Arzimanoglou, ‡Anne T. Berg, §Martin J. Brodie, ¶W. Allen Hauser, #[2]Gary Mathern, **Solomon L. Moshé, ††Emilio Perucca, ‡‡Samuel Wiebe, and §§[2]Jacqueline French

Drug resistant epilepsy is defined as

"Failure of adequate trials of two tolerated, appropriately chosen and used antiepileptic drug schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom"

ทำไมจึงต้องผ่าตัด ?





Epilepsy Surgery; Why?

- Adverse effect of recurrent seizures on brain development, learning, and memory
- Psychosocial issue: depression, aggressive behavior, stigma, social isolation, increased utilization of medical services
- Side effects of anticonvulsants
- Premature death: SUDEP
- ……

Epilepsy Surgery; Why?

- Increased plasticity of developing brain in children
- Shorter duration of intractable epilepsy determined better post-operative outcome
- In large series, there is a delay between onset of epilepsy and presurgical evaluation of ~ 20 years, even when the refractoriness of the epilepsy became clear at an average time of 9 years

Berg AT, Neurology. 2003;60:186–190

Long-term Outcomes

	N	Years of FU	Seizure-free outcome (%)
Hamiwka L. et al 2005	38	10	Tumors (72) Cortical dysplasia (32)
Kloss S. et al 2002	68	3-10	Cortical dysplasia (50)
Mittal S. et al 2005	109	5-20	Temporal lobe epilepsy (82)

Increasing Utilization of Pediatric Epilepsy Surgery

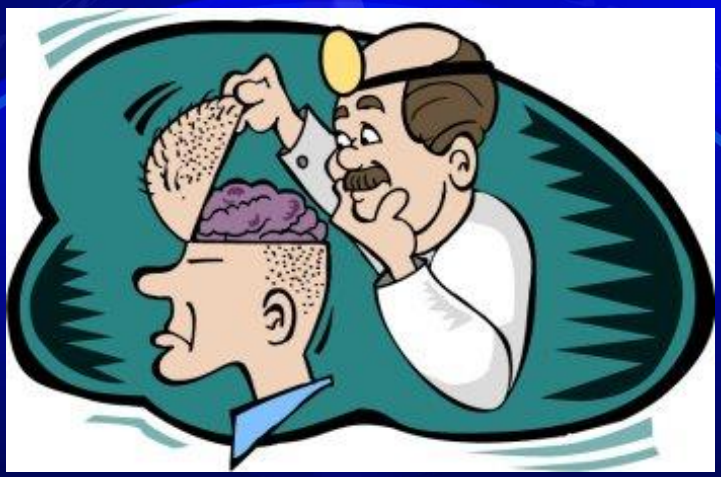
Table 2. The number of surgeries by procedures over time

Type of procedures, n (%)[a]	1997	2000	2003	2006	2009
Number of cases (weighted)	375	410	589	683	706
Lobectomies, n (%)	145 (39)	135 (33)	197 (33)	194 (28)	205 (29)
Partial lobectomies, n (%)	177 (47)	223 (54)	287 (49)	376 (55)	404 (57)
Hemispherectomy, n (%)	53 (14)	57 (14)	117 (20)	130 (19)	120 (17)

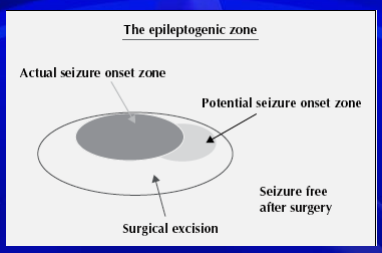
[a]Procedures may not add up to 100% due to multiple procedures in one stay.

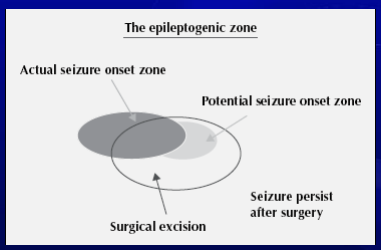
Pestana KE., Epilepsia. 2015;56:375–381

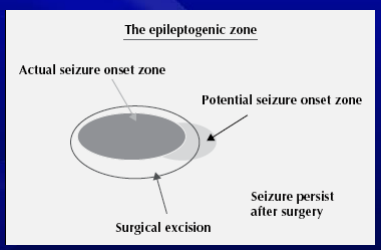
การประเมินก่อนการผ่าตัด



Principles of the Epileptogenic Region (ER)







Lüders HO, Epileptic Disord 2006;8 (Suppl. 2):S1-9

Presurgical Evaluation

- Video EEG monitoring
- MRI brain
- Interictal/ictal SPECT
- Positron emission topography(PET)
- Magnetic electroencephalography(MEG)
- Dense array EEG
- EEG-fMRI

ER

- Functional MRI (fMRI)
- Wada test (intracarotid sodium amobarbital)
- Neuropsychological tests

Functional mapping test

History Taking

- "Patient is the best detective"
- "Take your time"
- Detail information of seizure semiology
  - Early beginning → Postictal period
- Duration, frequency, time-specific, task-specific
- Perinatal insults, febrile status, stroke/traumatic brain injury
- Development history
- Clarification all aspects with the patients/parents (misconcept)

Physical Examination

- Skin lesions of NQ syndrome
  - Tuberous sclerosis, SWS
- Any focal neurological deficit
  - Weakness
  - Long tract signs
  - Visual field defect
  - Parietal lobe signs
    - cortical sensory loss, Gerstmann phenomenon
  - Etc.

Semiologic Classification of Seizures

1. Auras
   - Somatosensory auras
   - Visual auras
   - Auditory aura
   - Gustatory auras
   - Olfactory auras
   - Autonomic auras
   - Abdominal auras
   - Psychic auras
2. Autonomic seizures
3. Dialeptic seizures
   - Typical dialeptic seizures

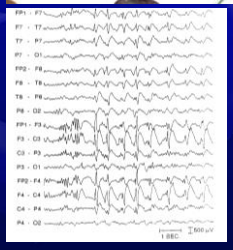
Han O Luders, Epileptic seizures: Pathophysiology and Clinical Semiology. 2000

Semiologic Classification of Seizures

4. Motor seizures
   - Simple motor seizures
     - Myoclonic seizures
     - Epileptic spasms
     - Tonic-clonic seizure
     - Tonic seizures
     - Clonic seizures
     - Versive seizures
   - Complex motor seizures
     - Hypermotor seizures
     - Automotor seizures
     - Gelastic seizures
5. Special seizures
   - Atonic seizures
   - Hypomotor seizures
   - Negative myoclonic seizures
   - Astatic seizures
   - Akinetic seizures
   - Aphasic seizures

Han O Luders, Epileptic seizures: Pathophysiology and Clinical Semiology. 2000

Epilepsy Monitoring Unit (EMU)



จำนวนรวมผู้ป่วยที่ Admit ห้อง EMU รามาธิบดี แต่ละปี (เริ่ม 13 ก.ค.52)

ปี พ.ศ.	จำนวน (ราย)
2552	6
2553	35
2554	33
2555	52
2556	51
2557	44

Interictal EEG

- Low cost and global accessibility
- A single discrete focus
- High reliability of localization: convexity foci
- False localization: basal, mesial temporal, or interhemispheric foci
- False lateralization: hemispheric syndromes
- Localized lesions may demonstrate interictal discharges multifocally at remote/contralateral sites or bilaterally
- Focal attenuation or bursts of fast activity

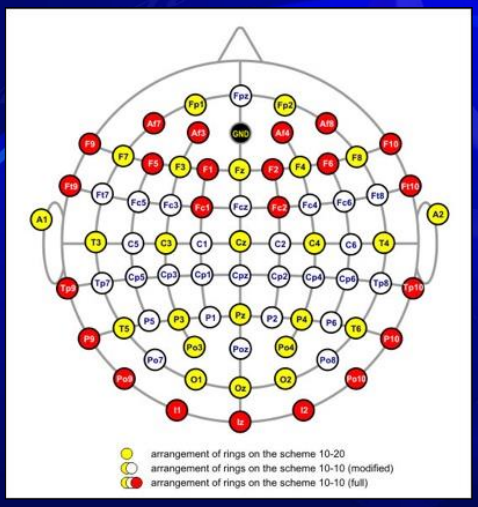
Jayakar P, Epilepsia 2014;55(4):507–518

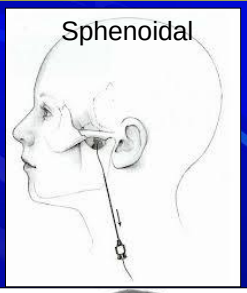
Ictal EEG with Video

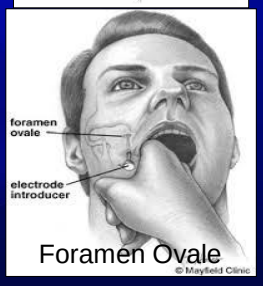
- Same limitations as the interictal discharges
- Low amplitude fast activity at seizure onset or deep foci may not be evident on the scalp
- Confirm seizure semiology
- Identification of multiple seizure types or nonepileptic events

Jayakar P, Epilepsia 2014;55(4):507–518

Additional Electrodes







Safety Issue

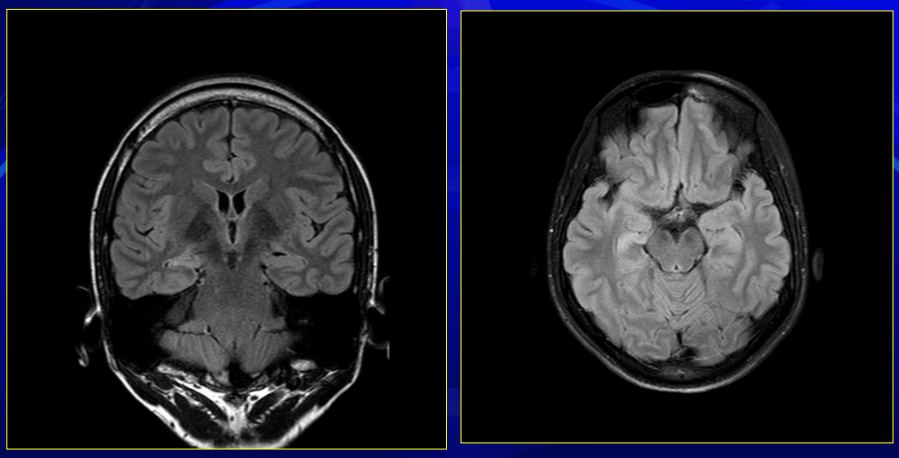
Medical complications	In pediatric EMU (454 admissions)	
Falls		1
Symptomatic subdural fluid collection		1
Hip pain		1
Postictal psychosis		1
Epileptic complications		
Status epilepticus	13 patients	17 events
Rescue medications given	35 patients	

Arrington DK, Epilep & Behav. 2013;27:346–350

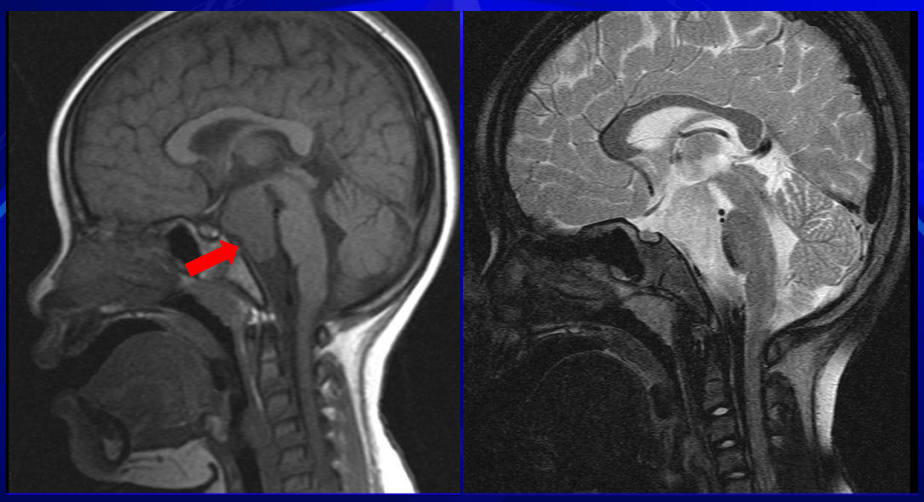
Magnetic Resonance Imaging

- **Focal cortical lesion** is a reliable marker of the location of the epileptogenic region(ER)
- Smaller or rarely larger than the ER
- May help restrict the extent of resection
- Multiple lesions (e.g., tuberous sclerosis or nodular heterotopias) does not necessarily mean that seizures are multifocal onset
- Standardized high resolution MRI protocol
- 3T MRI is superior to 1.5T
- “Unfavorable time window” (6 mo – 2 y)

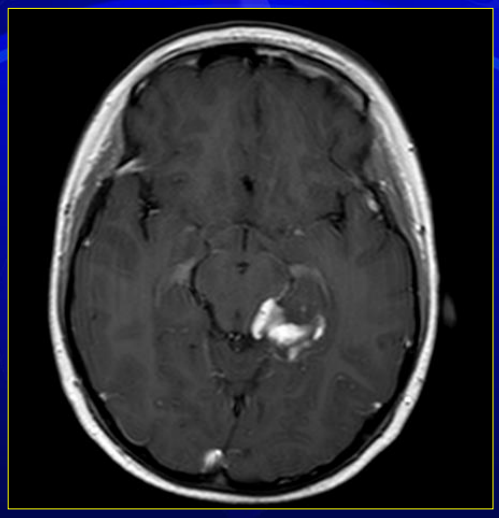
MRI Brain: MTS



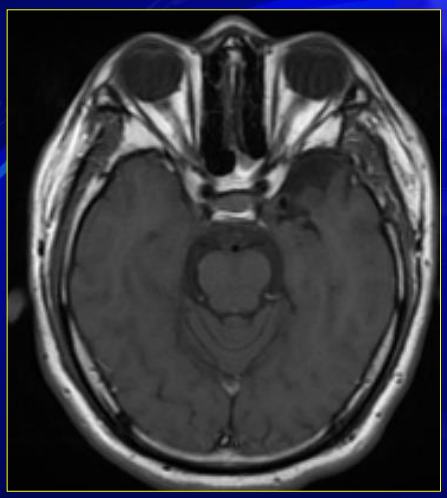
MRI Brain: HT Harmatoma



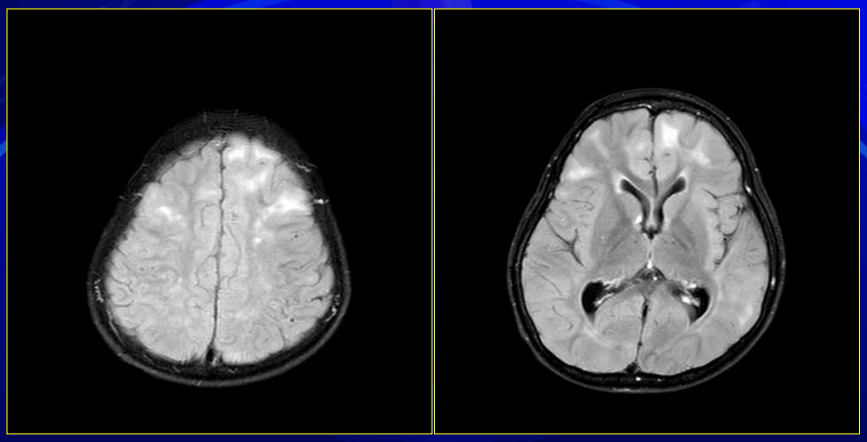
MRI Brain: Ganglioglioma



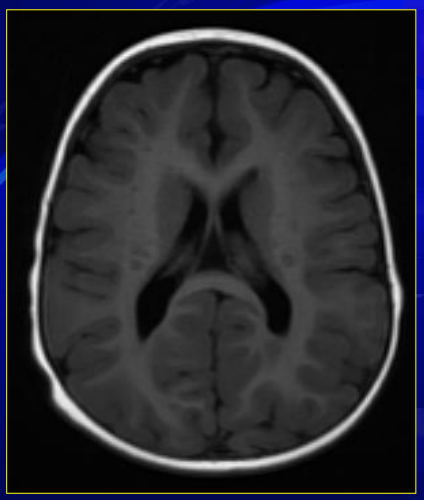
หลอดเลือดผิดปกติในสมอง : AVM & Cavernoma

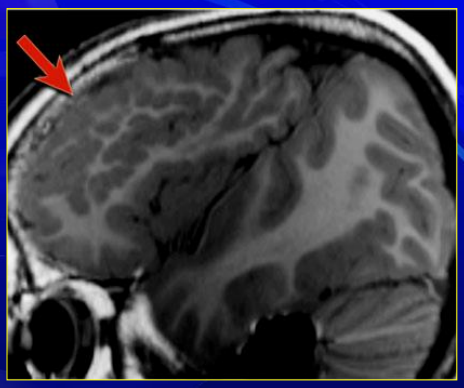


MRI Brain ในผู้ป่วย TSC



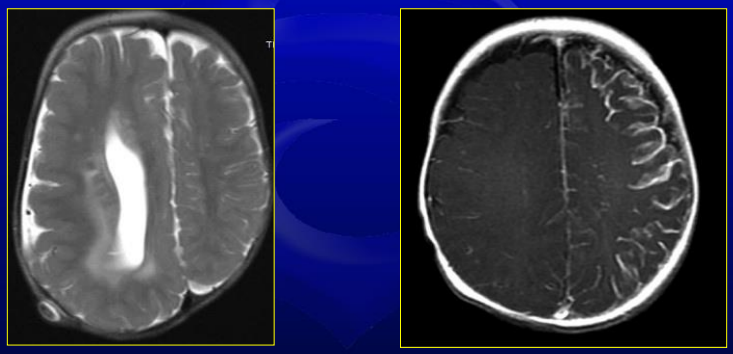
MRI Brain: Heterotopia & Polymicrogyria



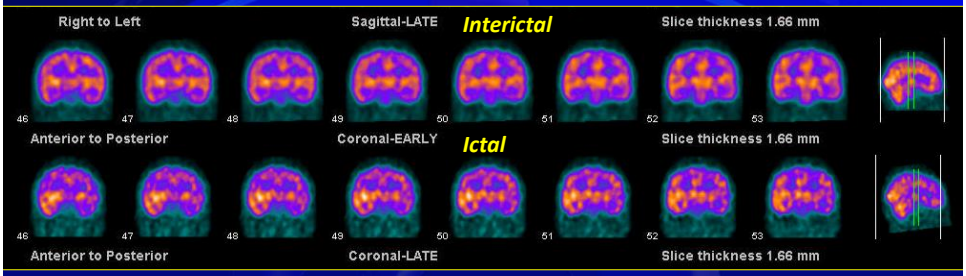


Hemimegalencephaly & Sturge-Weber Syndrome

- Medically refractory, catastrophic epilepsy
- Focal deficit: hemiparesis
- Hemisperectomy: plasticity of developing brain

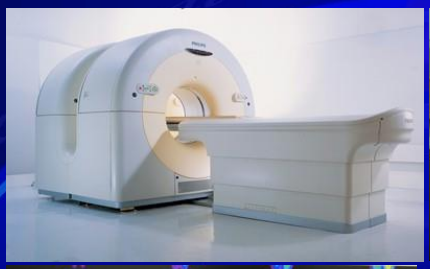


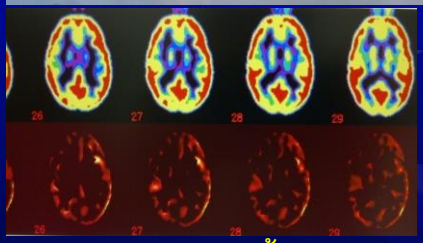
SPECT

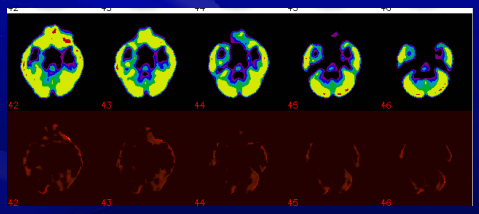


ขณะชัก: มีการไหลเวียนของเลือดเพิ่มขึ้นที่สมองด้านขวาล่าง

PET Scan



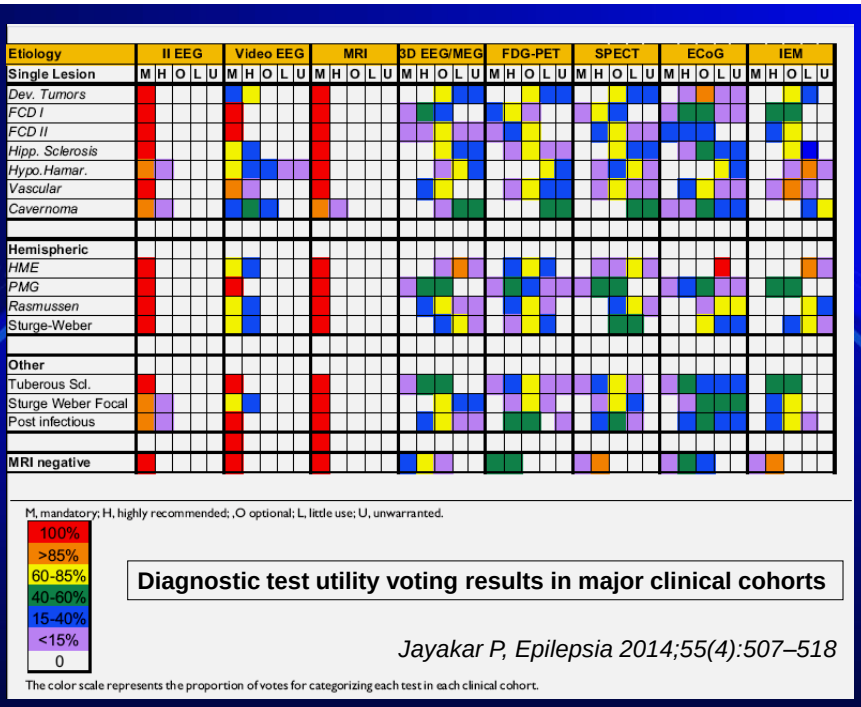




ขณะไม่ชัก: มีการใช้น้ำตาลกลูโคสลดลงที่สมองด้านขวาทางด้านหน้า

Neuropsychology & Neurodevelopmental Testing

- Baseline data for later comparison to quantify surgical impact and outcome
- Characterization of cognitive strengths and deficits sometimes not previously detected
- Informing the risk of postoperative deficits
- Contribution to the localization/lateralization of function
- Delineation of specific aims of surgery
- Information pertinent for educational and rehabilitation planning



Diagnostic test utility voting results in major clinical cohorts

Jayakar P, Epilepsia 2014;55(4):507–518

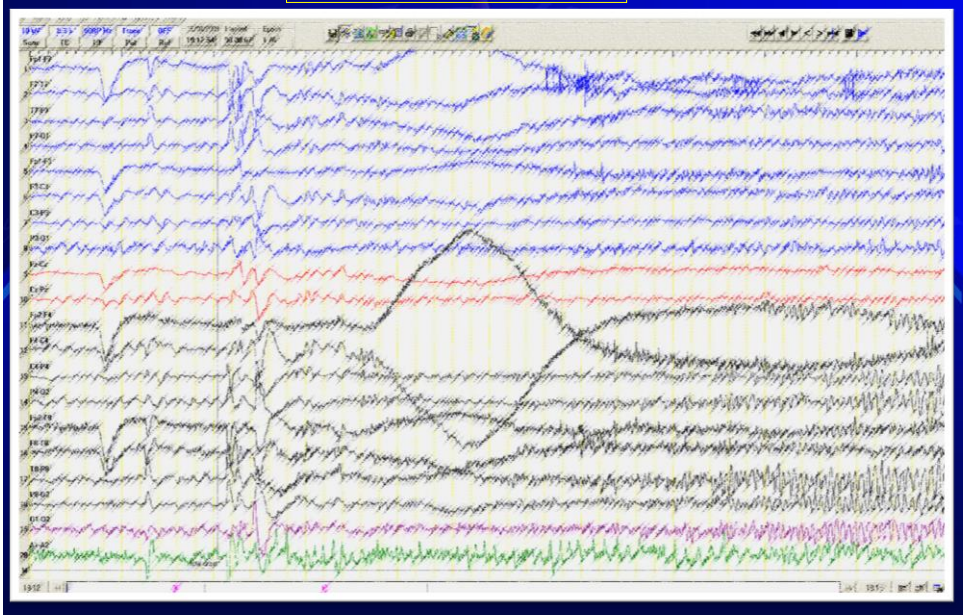
Case Demonstration

- A Thai 13-year-old girl
- Seizure onset 3 years
- Seizure Semiology:
  - Abdominal aura →Hand and/or oral automatisms → Complex motor seizure → GTC (rare)
  - Duration~ 2-5 min
  - Frequency: 1-2/week up to daily
- Current AEDs: Valproate, Topiramate
- IQ: Slow learner

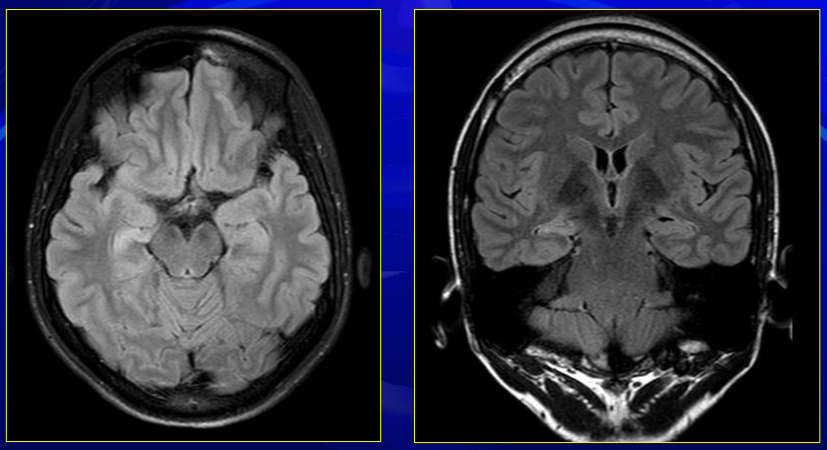
Video EEG moitoring

- Video will be presented

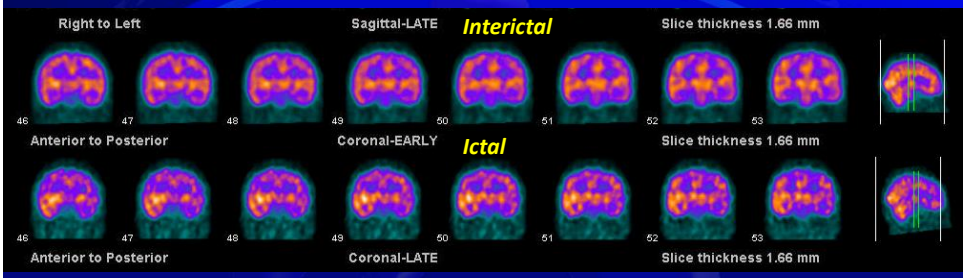
Ictal EEG



MRI brain



SPECT



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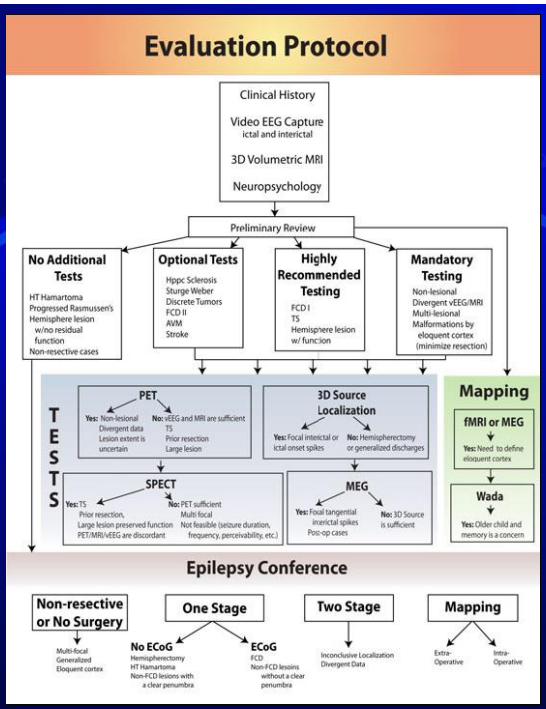
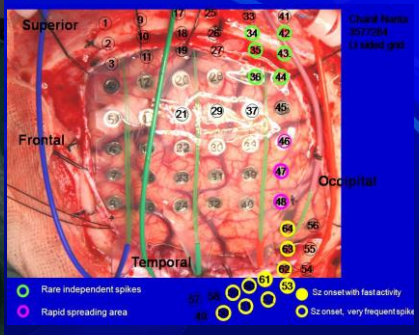


การผ่าตัดสองขั้นตอน
(Invasive Monitoring)



Ramathibodi Excellent & Comprehensive Epilepsy Center- "RECEC"

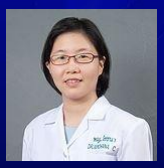
- Medicine & Pediatrics
- Neurosurgery
- Neuroradiology & Nuclear medicine
- Psychiatry
- Neuropathologist
- Nurses & EEG technicians

Ramathibodi Excellent & Comprehensive Epilepsy Center





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