

Treatment of adult epilepsy syndrome with the guidance of EEG findings

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Role of EEG

Diagnosis and Treatment

- Epilepsy
- Status epilepticus
- Other neuropsychiatric syndromes

Decision making: When to start AEDs, Which AEDs of choices, other Rx

Monitoring AEDs: side effects, response, when to withdrawal medications

Subjects presenting with their first unprovoked seizures: a systematic review

EEG	Pooled risk of recurrence at 2 years
Normal	27%
Non-specific abnormalities	37%
Epileptiform activity	58%

Prediction of seizure relapse after withdrawal of antiepileptic drug treatment

The relative risk of relapse

- Abnormal EEG – ranges 0.8–6.47

High risk of relapse

- Photosensitivity
- Juvenile myoclonic epilepsy
- Symptomatic seizure disorders

Routine EEG

Interictal EEG: negative

- Decision of Rx: Clinical based

Interictal EEG: positive but clinically well controlled by EEG

- Unnecessary to treat all abnormalities in interictal EEG
- ? suppression of interictal discharges may improve school performance in some children with cognitive impairments

Routine EEG

Investigation of cognitive decline

- Dementia, Delirium
- Immune-mediated encephalopathies
- Prion diseases, slow-virus diseases

Long term video EEG

An important role in diagnosis of paroxysmal neurological attacks

- Differentiation between nocturnal epilepsy and parasomnias
- Diagnosis of psychogenic non-epileptic seizures
- Characterization of seizure types (focal vs. generalized)
- Quantification of IED or seizure frequency
- Identification of epileptogenic region in epilepsy surgery candidates
- Detection of non-convulsive status epilepticus (at least 24 hours)

Diagnosis and Treatment

Epilepsy (adult)

Status epilepticus

Other neuropsychiatric syndromes

Adult epilepsy syndrome

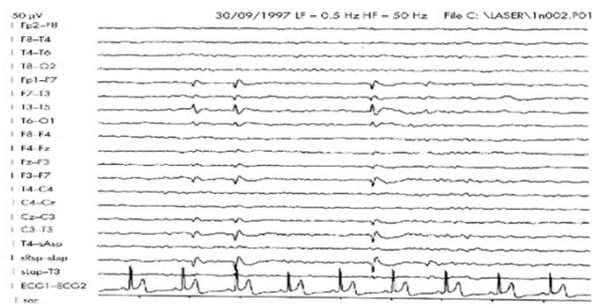
Focal epilepsies

- Temporal lobe epilepsies
- Frontal lobe epilepsy (SHE)
- etc.

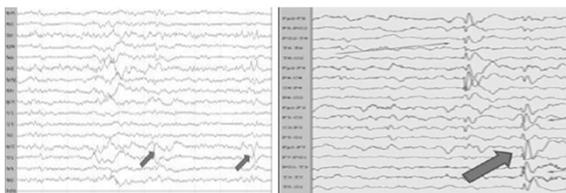
Generalized epilepsy

- JME
- LGS
- PME
- etc.

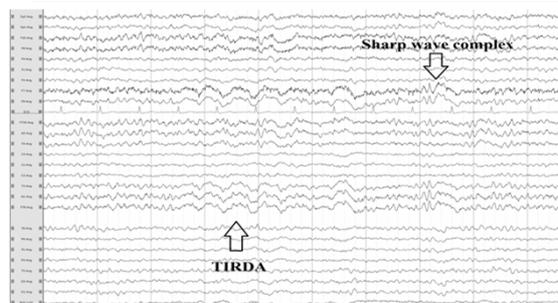
Interictal focal temporal discharges in left mesial temporal epilepsy



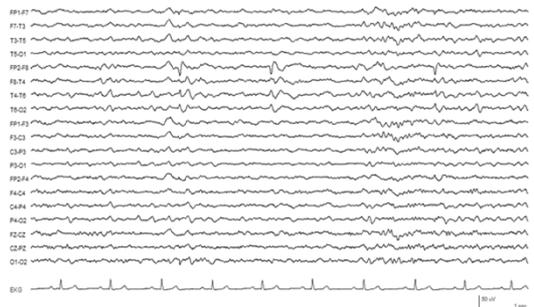
T2 phrase reversal



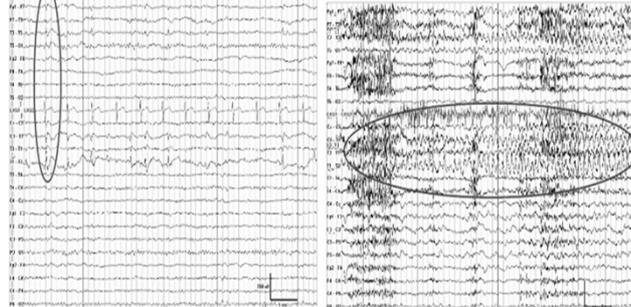
Temporal interictal rhythmic delta activity (TIRDA)



Temporal discharges



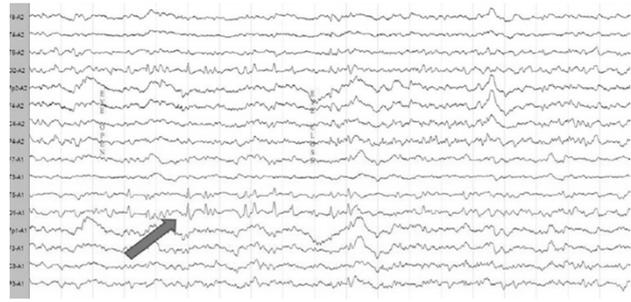
Temporal lobe discharges



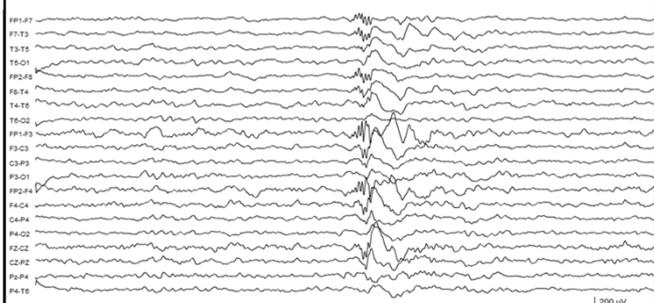
Parietal lobe spikes



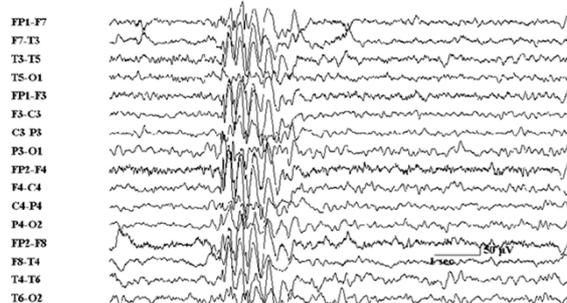
Occipital lobe spikes



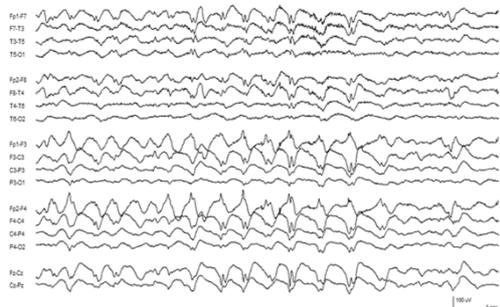
Generalized polyspike wave



EEG in JME



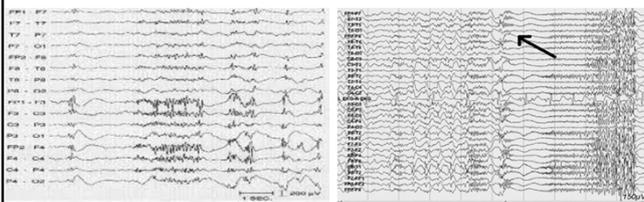
Slow spike-wave



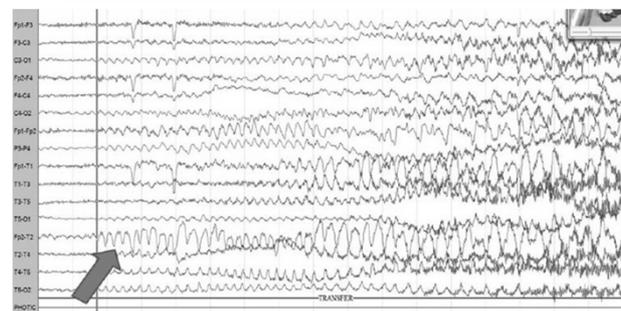
Ictal EEGs

- Beta fast
- Spikes, spikes-waves
- Rhythmic activity
- Build-up (frequency, amplitude, spreading)
- Evolution, background disruptions

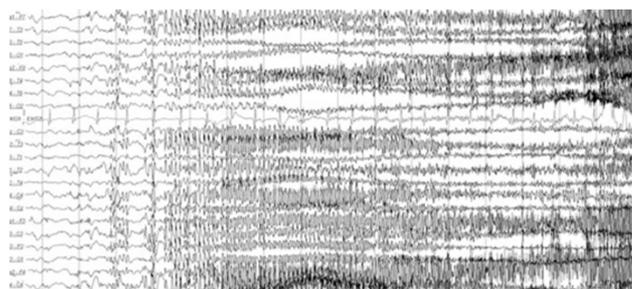
Generalized paroxysmal fast activity



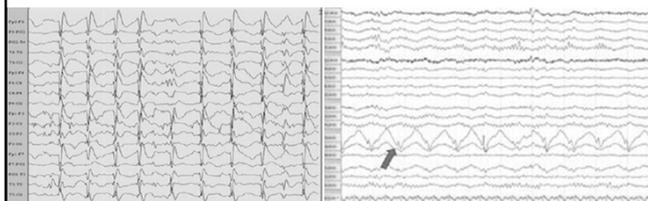
T2

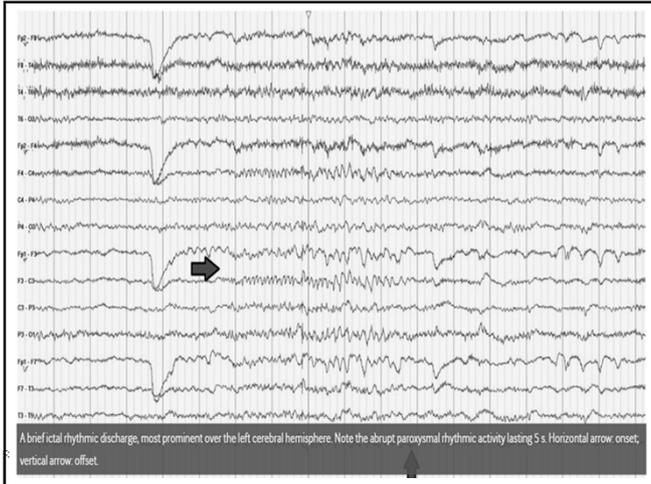


GTC



Generalized





Evidence-Based Guidelines for the Treatment of Epileptic Seizures with AEDs

Optimal initial monotherapy for patients with newly diagnosed or untreated epilepsy

ILAE multi-countries Team

- Epileptologists
- Clinical pharmacologists
- Statistician
- Methodologist

Epilepsia, 54(3):551-563, 2013
doi: 10.1111/epi.12074

SPECIAL REPORT

Updated ILAE evidence review of antiepileptic drug efficacy and effectiveness as initial monotherapy for epileptic seizures and syndromes

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Table 3. Relationship between clinical trial ratings, level of evidence, and conclusions

Combination(s) of clinical trial ratings	Level of evidence	Conclusions
≥ 1 Class I studies or meta-analysis meeting class I criteria sources OR ≥ 2 Class II studies	A	AED established as efficacious or effective as initial monotherapy
1 Class II study or meta-analysis meeting class II criteria OR ≥ 2 Class III double-blind or open-label studies	B	AED probably efficacious or effective as initial monotherapy
≥ 2 Class III double-blind or open-label studies	C	AED possibly efficacious or effective as initial monotherapy
1 Class III double-blind or open-label study OR ≥ 1 Class IV clinical studies OR Data from expert committee reports, opinions from experienced clinicians	D	AED potentially efficacious or effective as initial monotherapy
Absence of directly applicable clinical evidence upon which to base a recommendation	E	No data available to assess if AED is effective as initial monotherapy
Positive evidence of lack of efficacy or effectiveness based on class I to IV studies OR Significant risk of seizure aggravation based on class I to IV studies	F	AED established as ineffective or significant risk of seizure aggravation

Recommendation (Based on efficacy and effectiveness data only)

Evidence Level	Conclusions	Recommendation
A	AED established as efficacious or effective as initial monotherapy	First line monotherapy
B	AED probably efficacious or effective as initial monotherapy	First line monotherapy
C	AED possibly efficacious or effective as initial monotherapy -	Alternative first line monotherapy
D	AED potentially efficacious or effective as initial monotherapy	Weak efficacy
E	No data available to assess if AED is effective as initial monotherapy	No data
F	AED established as ineffective or significant risk of seizure aggravation	Should <u>not</u> be used for initial monotherapy

AEDs for

Adults with partial-onset seizures

Elderly with partial-onset seizures

Adults with generalized-onset tonic-clonic seizures

JME

Optimal initial monotherapy for patients with newly diagnosed or untreated epilepsy

Partial Seizures: Adults recommendations

Level	AEDs
A	CBZ, PHT, LEV, ZNS
B	VPA
C	GBP, LTG, OXC, PB, TPM, VGB
D	CZP, PRM
E	Others
F	None

Optimal initial monotherapy for patients with newly diagnosed or untreated epilepsy

Partial Seizures: Elderly recommendations

Level	AEDs
A	GBP, LTG
B	None
C	CBZ
D	TPM, VPA
E	Others
F	None

Optimal initial monotherapy for patients with newly diagnosed or untreated epilepsy

Generalized onset Tonic Clonic Seizures: Adults Recommendations

Level	AEDs
A	None
B	None
C	CBZ*, PHT*, LTG, OXC, PB, PHT, TPM, VPA
D	GBP, LEV, VGB
E	Others
F	None

*=may aggravate tonic clonic seizures and more commonly other generalized seizure types, should be used with caution

Optimal initial monotherapy for patients with newly diagnosed or untreated epilepsy

Juvenile Myoclonic Epilepsy: Adult Recommendations

Level	AEDs
A	None
B	None
C	None
D	TPM, VPA (ZNS, CZP, LTG*, LEV)
E	Others
F	CBZ*, GBP, OXC*, PHT*, TGB, VGB

*may aggravate myoclonic seizure types, should be used with caution

Table 4. Summary of studies and level of evidence for each seizure type and epilepsy syndrome

Seizure type or epilepsy syndrome	Class I studies	Class II studies	Class III studies	Level of efficacy and effectiveness evidence (in alphabetical order)
Adults with partial-onset seizures	4	1	34	Level A: CBZ, LEV, PHT, ZNS Level B: VPA Level C: GBP, LTG, OXC, PB, TPM, VGB Level D: CZP, PRM
Children with partial-onset seizures	1	0	19	Level A: OXC Level B: None Level C: CBZ, PB, PHT, TPM, VPA, VGB Level D: CLB, CZP, LTG, ZNS
Elderly adults with partial-onset seizures	1	1	3	Level A: GBP, LTG Level B: None Level C: CBZ Level D: TPM, VPA
Adults with generalized onset tonic-clonic seizures	0	0	27	Level A: None Level B: None Level C: CBZ, LTG, OXC, PB, PHT, TPM, VPA Level D: GBP, LEV, VGB
Children with generalized-onset tonic-clonic seizures	0	0	14	Level A: None Level B: None Level C: CBZ, PB, PHT, TPM, VPA Level D: OXC
Children with absence seizures	1	0	7	Level A: ESPM, VPA Level B: None Level C: LTG Level D: None
Benign epilepsy with centrotemporal spikes (BECTS)	0	0	3	Level A: None Level B: None Level C: CBZ, VPA Level D: GBP, LEV, OXC, STM
Juvenile myoclonic epilepsy (JME)	0	0	1	Level A: None Level B: None Level C: None Level D: TPM, VPA

Diagnosis and Treatment

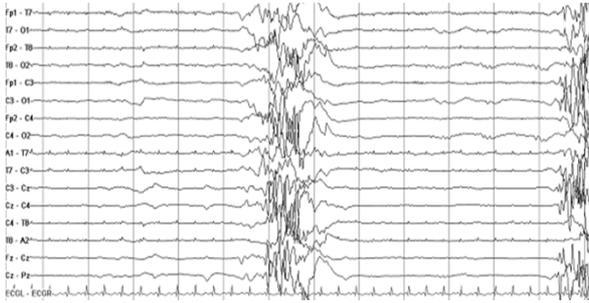
Epilepsy (adult)

Status epilepticus

Other neuropsychiatric syndromes

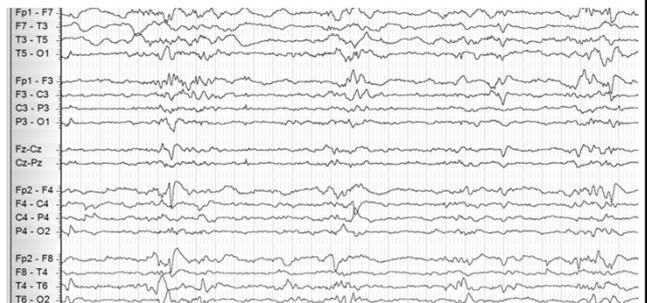
Convulsive status epilepticus

EEG: goal of Rx: burst suppression



Convulsive status epilepticus

EEG: goal of Rx: burst suppression

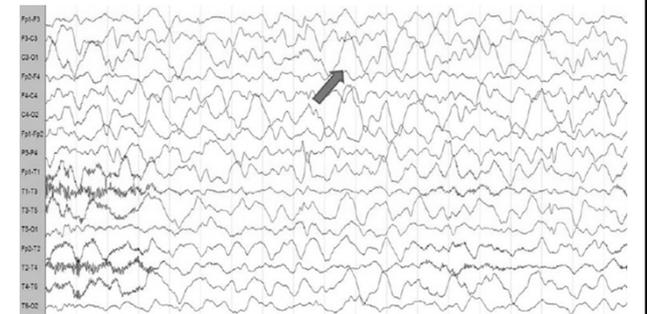


Comatose patients

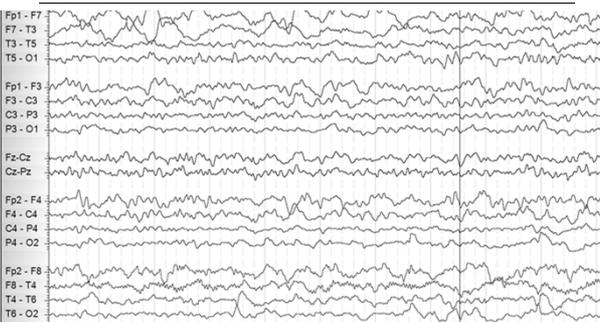
DDx:

- Encephalopathy: toxic, metabolic, anoxia
- Electrical status epilepticus
- Catatonia, PNES

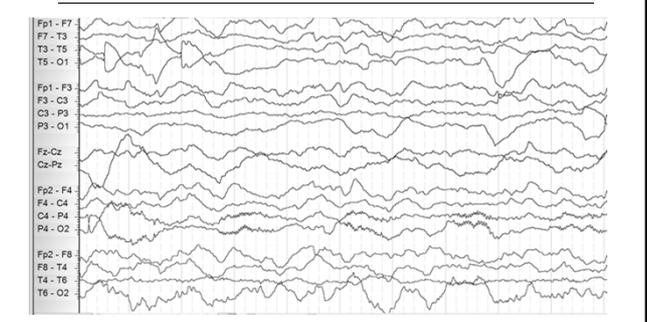
Delta waves



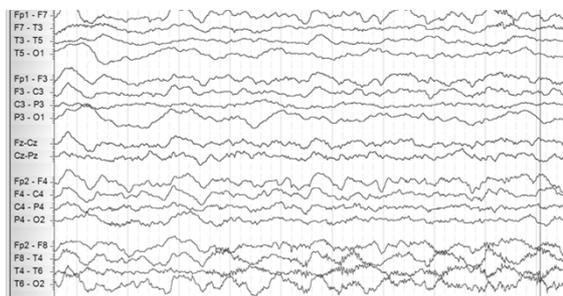
Encephalopathy



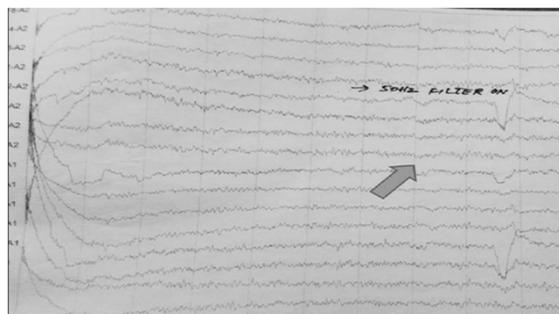
Diffuse slow



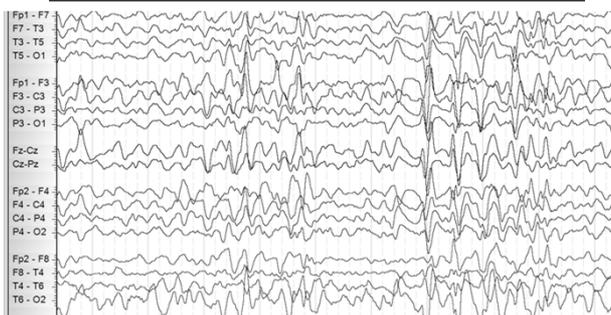
Encephalopathy



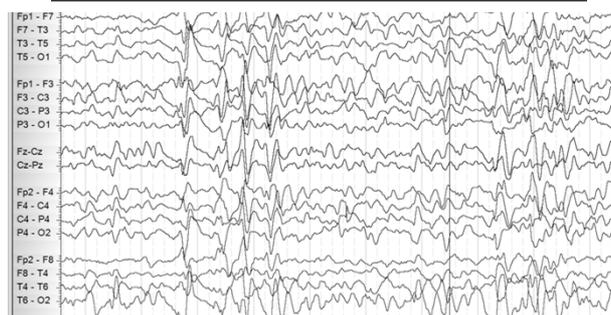
Beta coma



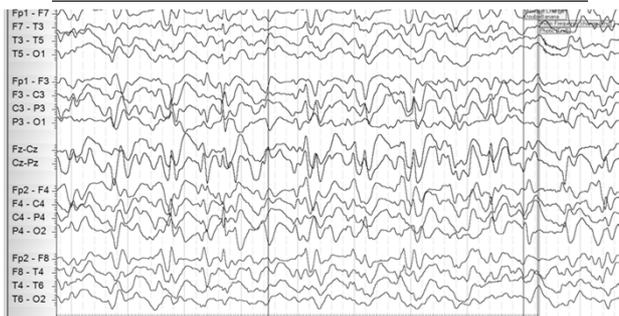
NCSE



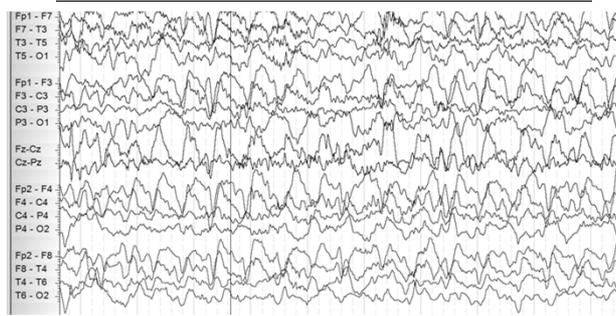
NCSE



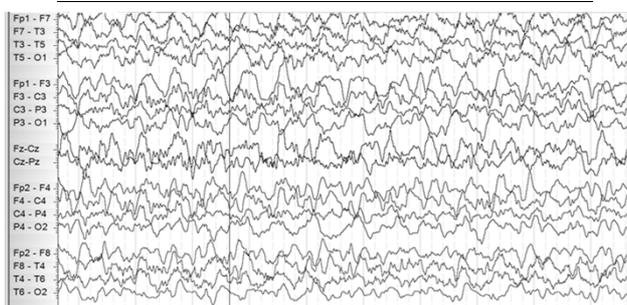
NCSE



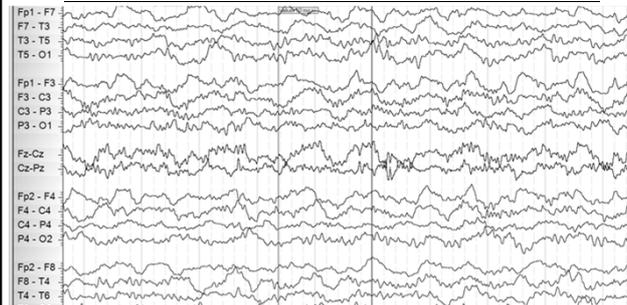
SE with positive benzodiazepine trial



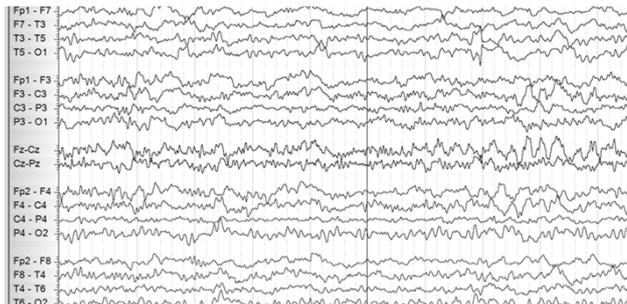
SE with positive benzodiazepine trial



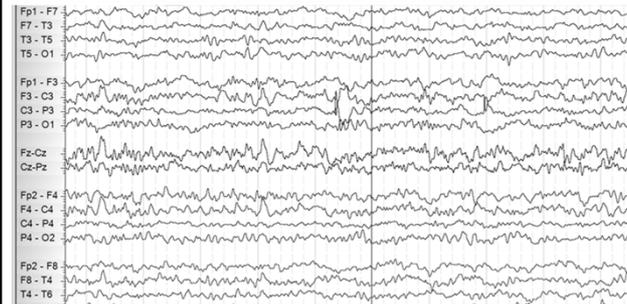
SE with positive benzodiazepine trial



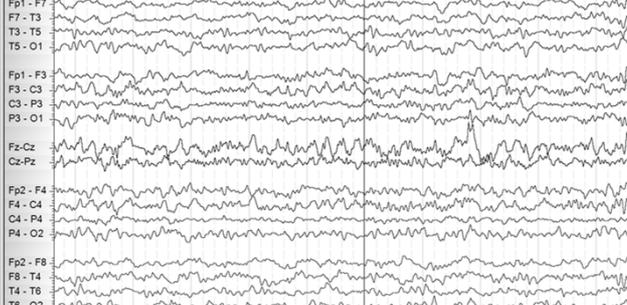
SE with positive benzodiazepine trial



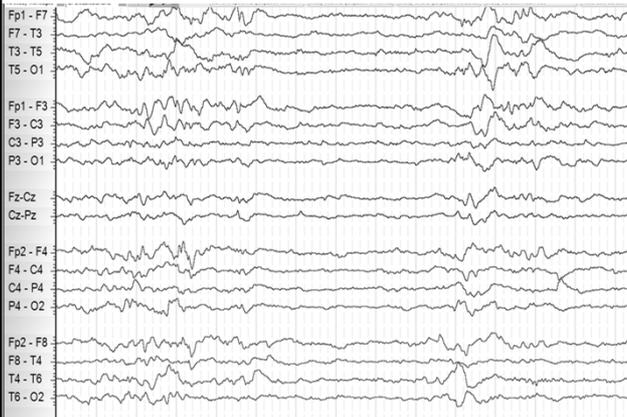
SE with positive benzodiazepine trial

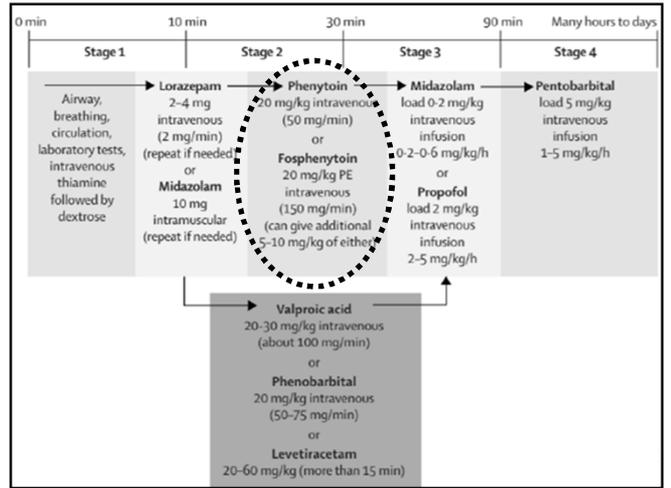
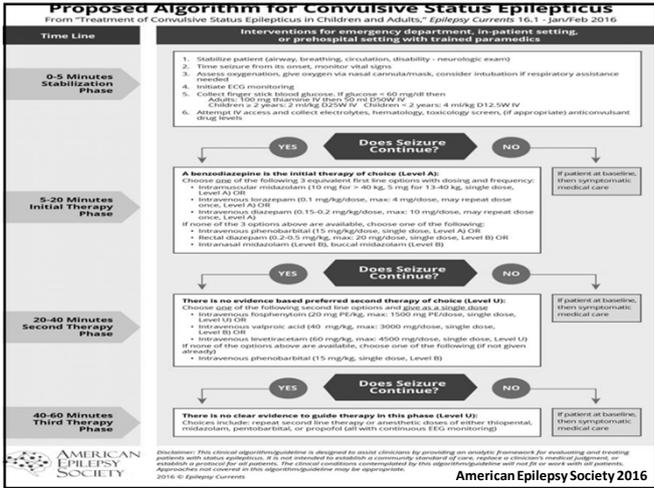


SE with positive benzodiazepine trial



EEG - Burst suppression: 1-2 s bursts of cerebral activity interspersed by 10 s intervals of background suppression, 12-24 hours before taper anesthetic agents





Diagnosis and Treatment

Epilepsy (adult)

Status epilepticus

Other neuropsychiatric syndromes

- **Autoimmune limbic encephalitis**
- **HSE, CJD, SSPE**

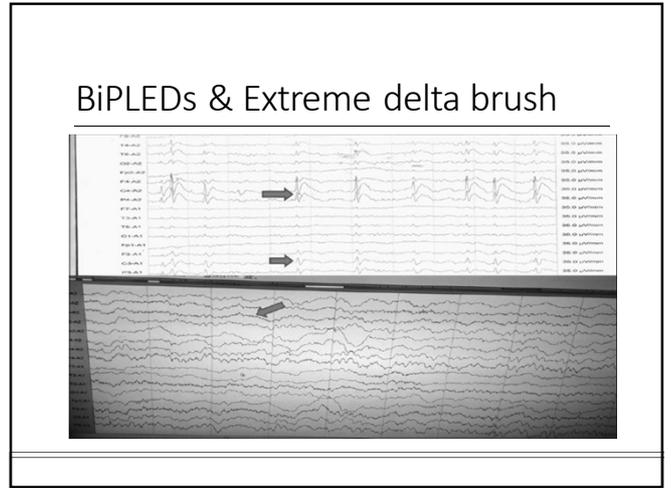
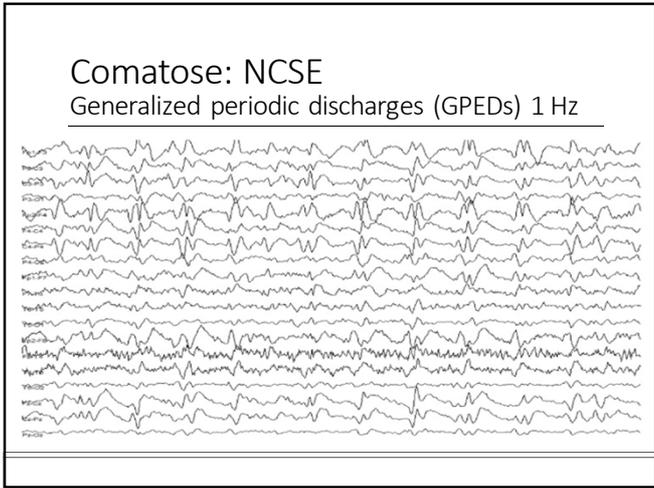
EEG in autoimmune limbic encephalitis

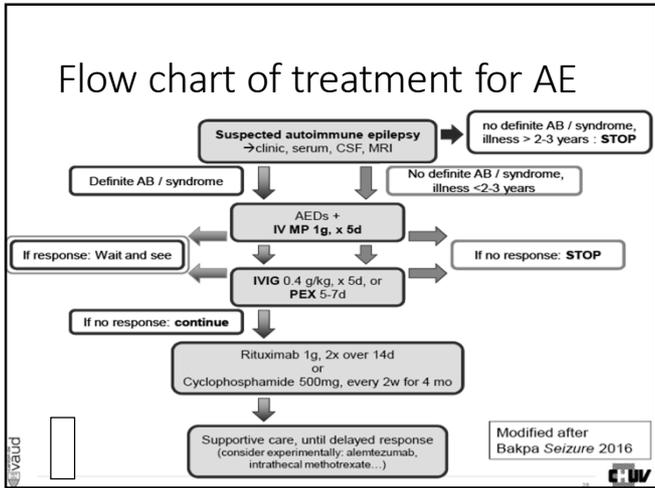
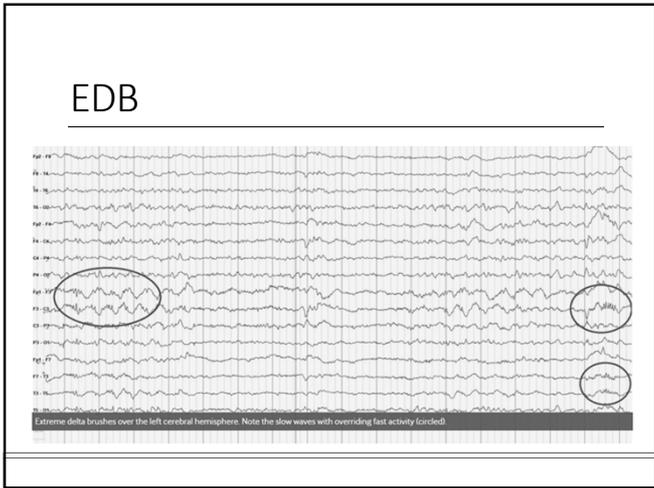
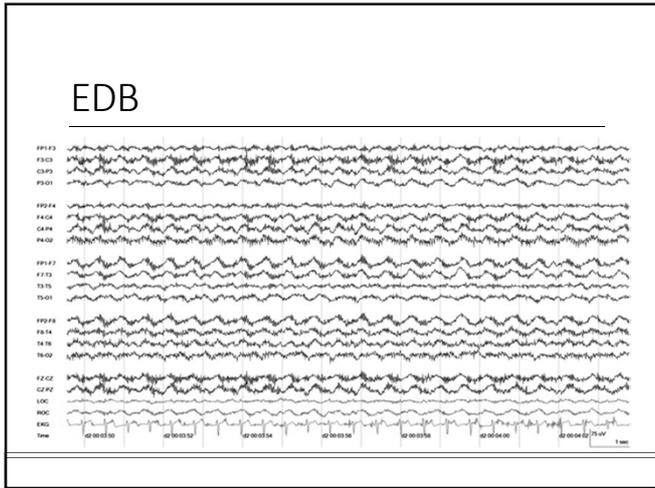
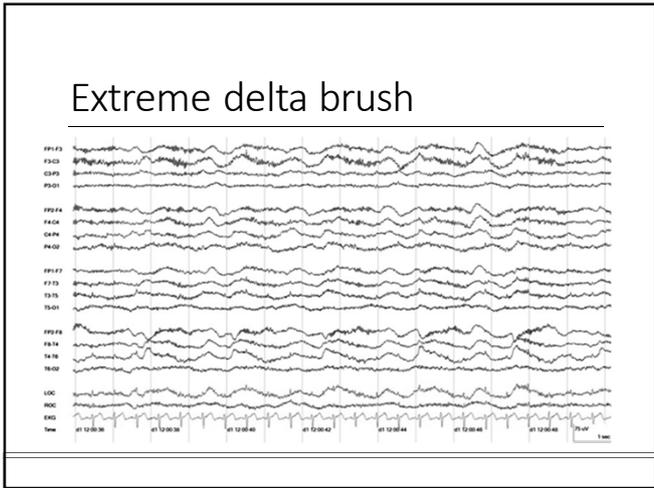
Non-specific findings

Triphasic patterns

PLEDs, BiPLEDs, GPEDs

Extreme delta brush (EDB)





Summary (1)

Treatment of adult epilepsy syndrome with the guidance of EEG findings

Role of EEG: Diagnosis and Treatment

- Epilepsy
- Status epilepticus
- Other neuropsychiatric syndromes, esp. HSE, limbic encephalitis

Decision making: When to start AEDs, Which AEDs of choices

Monitoring: side effects, response, when to withdrawal medications

Summary (2)

EEG Pitfalls

- Some patterns are non-specific
- Some patterns are pathognomonic
- EEG can be false negative and false positive
- Clinical correlation !!!