When is a spike a spike?

When is a spike one with likely clinical significance?



EEG analysis and layers of complexity

- 1. Sleep
- 2. Artefacts
- 3. Benign variants that look epileptiform

• Displaying the EEG

A "straight-forward" focus

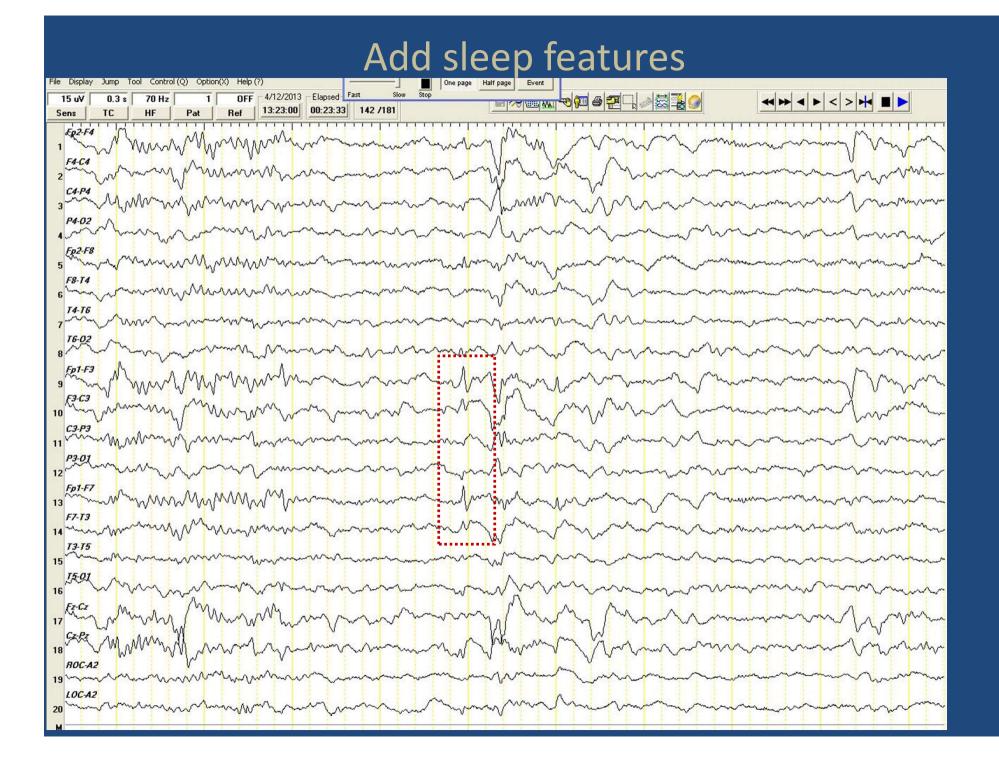
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Add sleep features

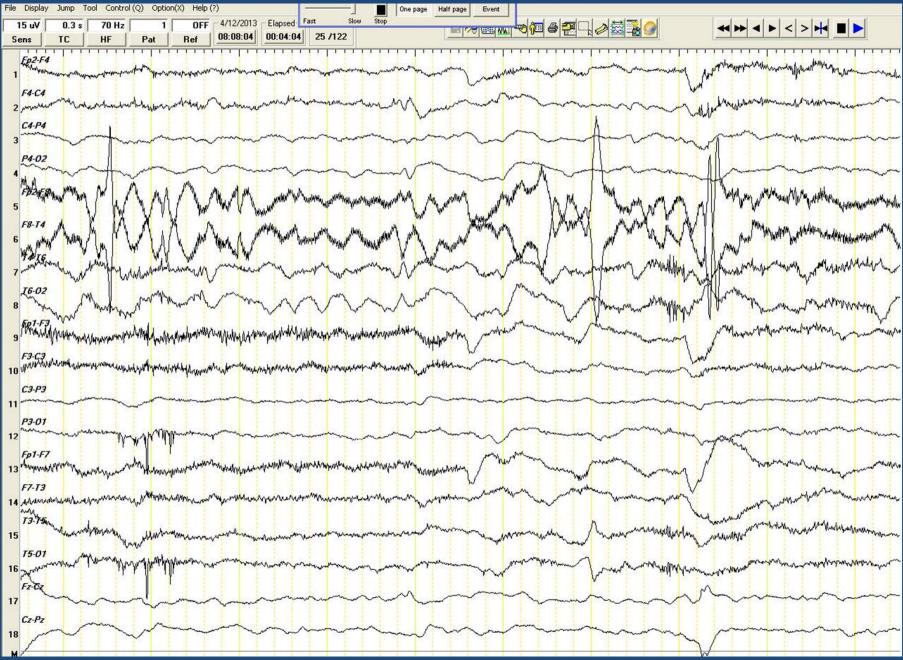




Add artefacts.



Add artefacts.



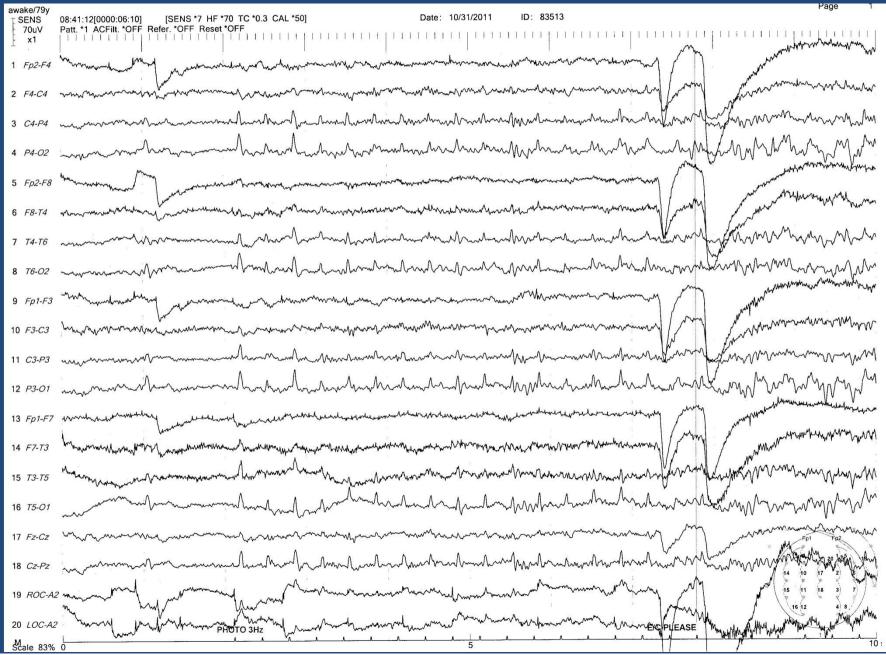
Same patient as previous slide – artefact resolved.



Add activation procedures - hv

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Add activation procedures - ips



Analysis problem from *Neurology* 2011

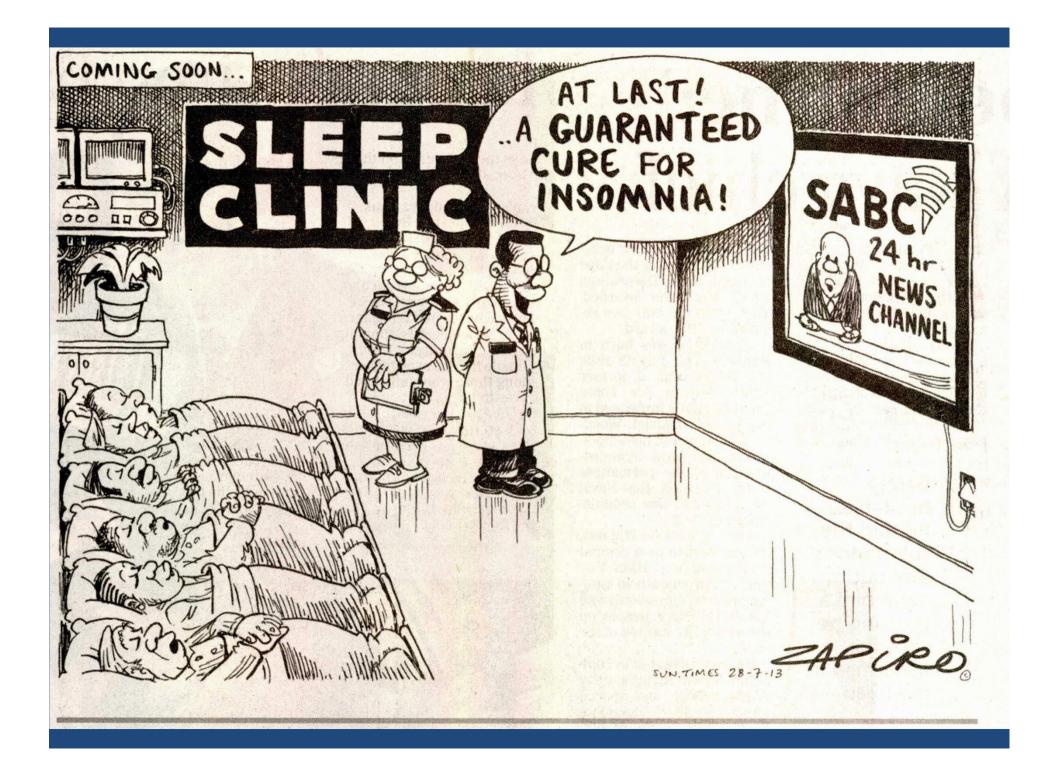
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Familiar display of slow alpha variant

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Sleep and Clinical EEGs

- 1. Why sleep is so important in clinical EEGs
- 2. Normal sleep features possibly confused with an epileptiform event



EPILEPTIFORM FEATURES ACTIVATED BY SLEEP

 Sleep highly effective for eliciting both generalized and focal interictal epileptiform discharges (IEDs).
 Overall far more so than HV or IPS

□ In some people with epilepsy IEDs only occur during sleep, e.g. in up to 1/3 of patients with complex partial epilepsy.

When IEDs occur in daytime sleep they tend to occur within 15-30 min of sleep onset.

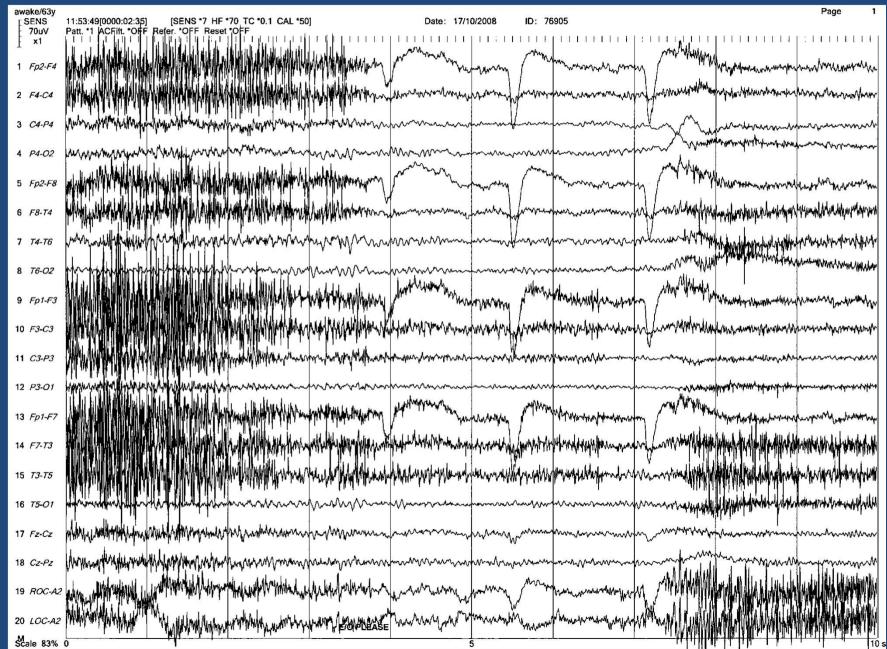
Sleep and Clinical EEGs

Sleep is a two-edged sword:

- activates some abnormalities
- makes interpretation more complex
- Benefits for interpretation
 - suppression of artefacts especially in restless or tense pts

- attenuation of some background activity that may conceal an abnormality, e.g. sharp or high voltage alpha

63-year-old – evaluated for suspected TLE: Awake



63-year-old – evaluated for suspected TLE: Asleep

Number State Total Addition State	awake/drows	sv/63v			Page 1
1 <i>PDSFR V</i>	TSENS	12:31:44[0000:40:30] [SE	NS *10 HF *70 TC *0.1 CAL *50]	Date: 17/10/2008 ID: 76905	
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Drowsiness

- Complexity is underestimated
- Much more <u>can</u> happen than simply the attenuation of the alpha rhythm
- Events specifically restricted to the temporal areas will be addressed in a separate session.
- To follow will be some widespread bilateral events.

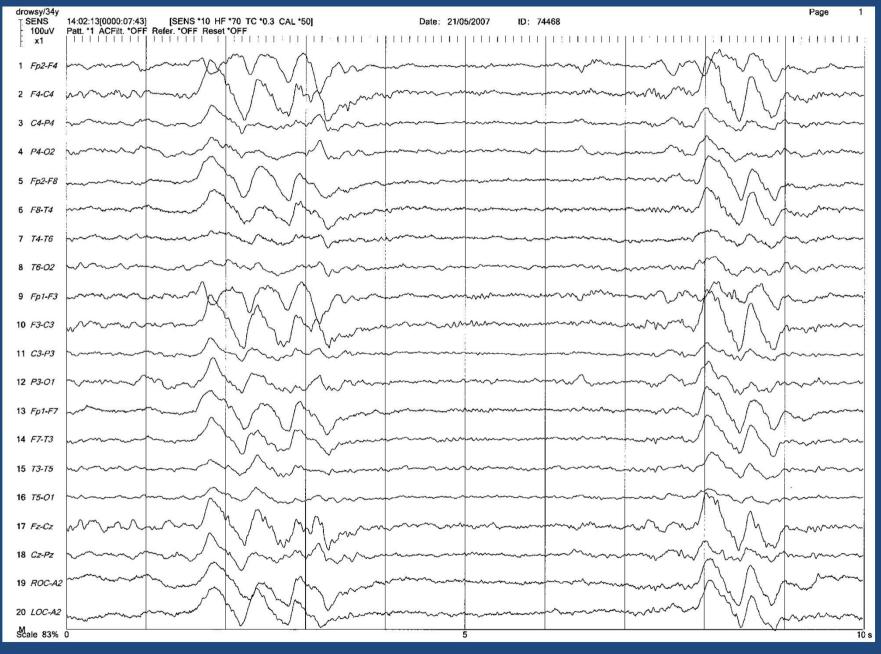
Appearance of theta activity

awake/drows	sv/30v								Page 1
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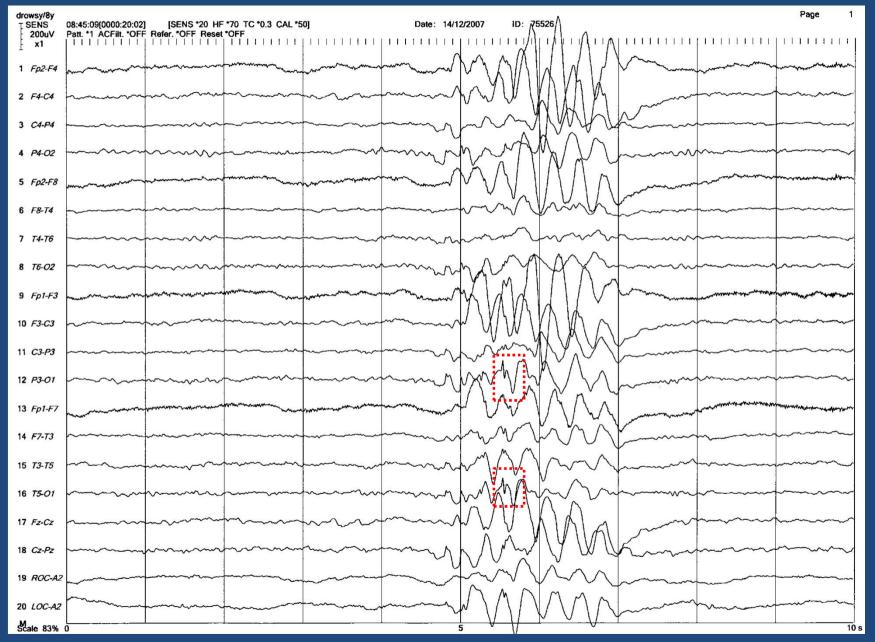
Burst patterns of drowsiness with sharp transients

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Burst patterns of drowsiness – Adult [9734 1.7]



Burst patterns of drowsiness – Child [9936 1.05]



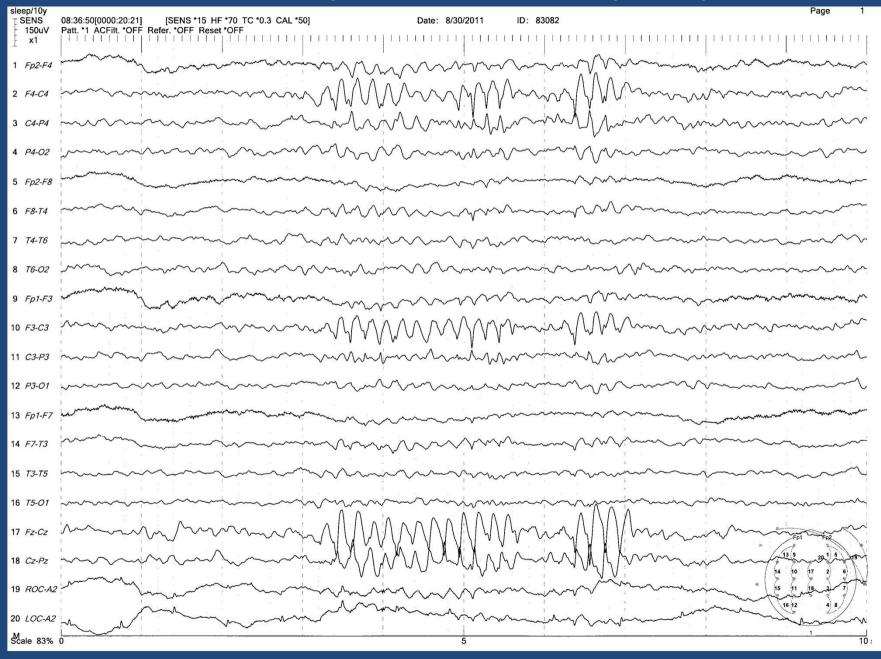
Arousal – delta burst at the sleep-wakefulness interface

56y/arousal ⊤SENS	08:42:52[0000:21:58] [SENS *7 HF *70 TC *0.1 CAL *50] Date: 1	/04/2010 ID: 80128 Page 1
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14 <i>F7-T3</i>	3 minung	Winning warman warma warman warma warma warma warma warma warma
15 <i>T3-T5</i>	5 martin martin marting	1 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm
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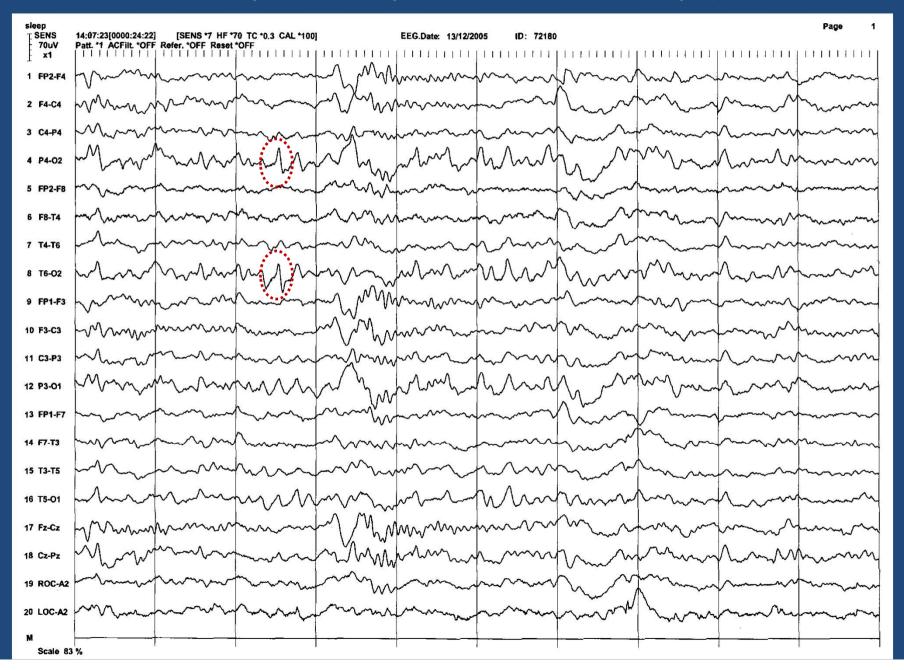
Sleep features: Sharp & possibly misinterpreted

- Vertex sharp transients
- POSTS (positive occipital sharp transients of sleep)
- Sharp sleep spindles
- K complex with a prominent sharp component.

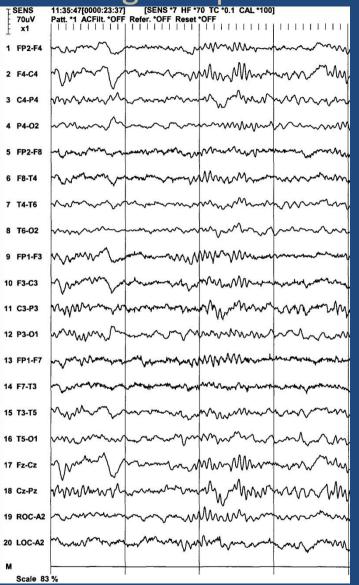
Vertex sharp transients – really sharp

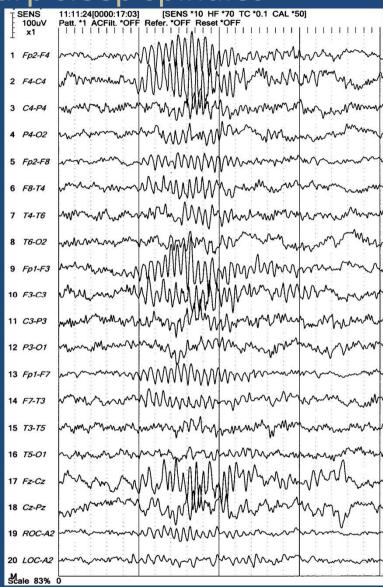


Positive occipital sharp transients of sleep (POSTS)



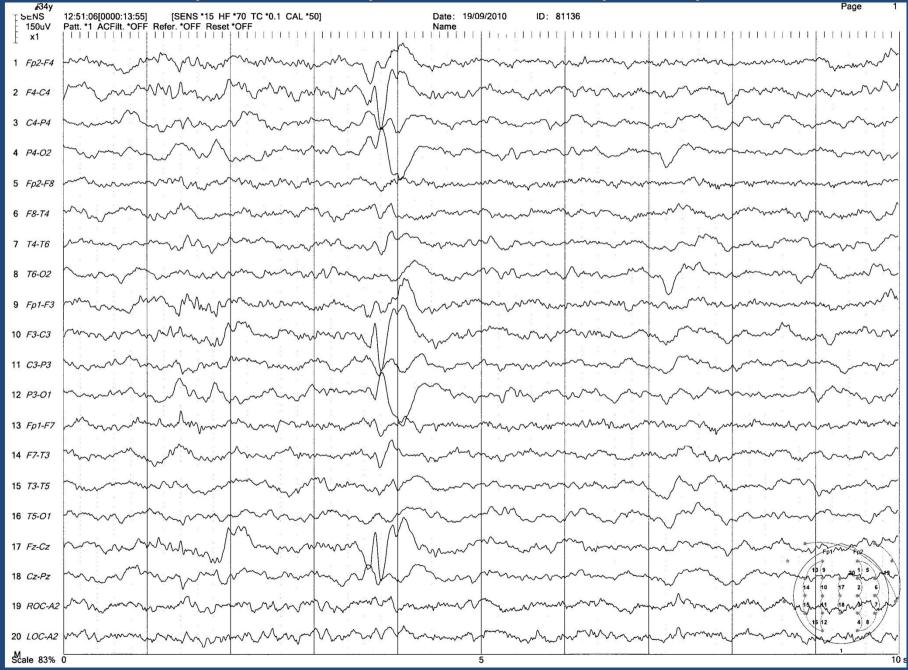






Sleep spindles in a 30-year-old patient (left panel, see 3rd second) contrasted with a much higher amplitude spindle in a 2-year-old child (right panel, see 2nd second).

K complex with a prominent sharp component



Frontal arousal rhythm in children

- Bursts/trains of rhythmic waves of varying frequency, lasting up to 20 sec
- Frequently sharp or notched
- Has a "superficial resemblance to a rhythmic discharge pattern"
- Initially linked to "minimal cerebral dysfunction" – currently considered to have no clinical significance

Frontal arousal rhythm in a 2-year-old

awake/2y T SENS	09:29:08[0000:23:12] [SENS *15 HF *70 TC *0.1 CAL *50] Date: 1/16/2012 ID: 83880 Page 1
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