What can be inferred from ictal behavioral manifestations in temporal lobe epilepsy patients?

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June 3rd, 2020

Disclaimers/conflicts of interest

Paid consultancy and speaker's honoraria:

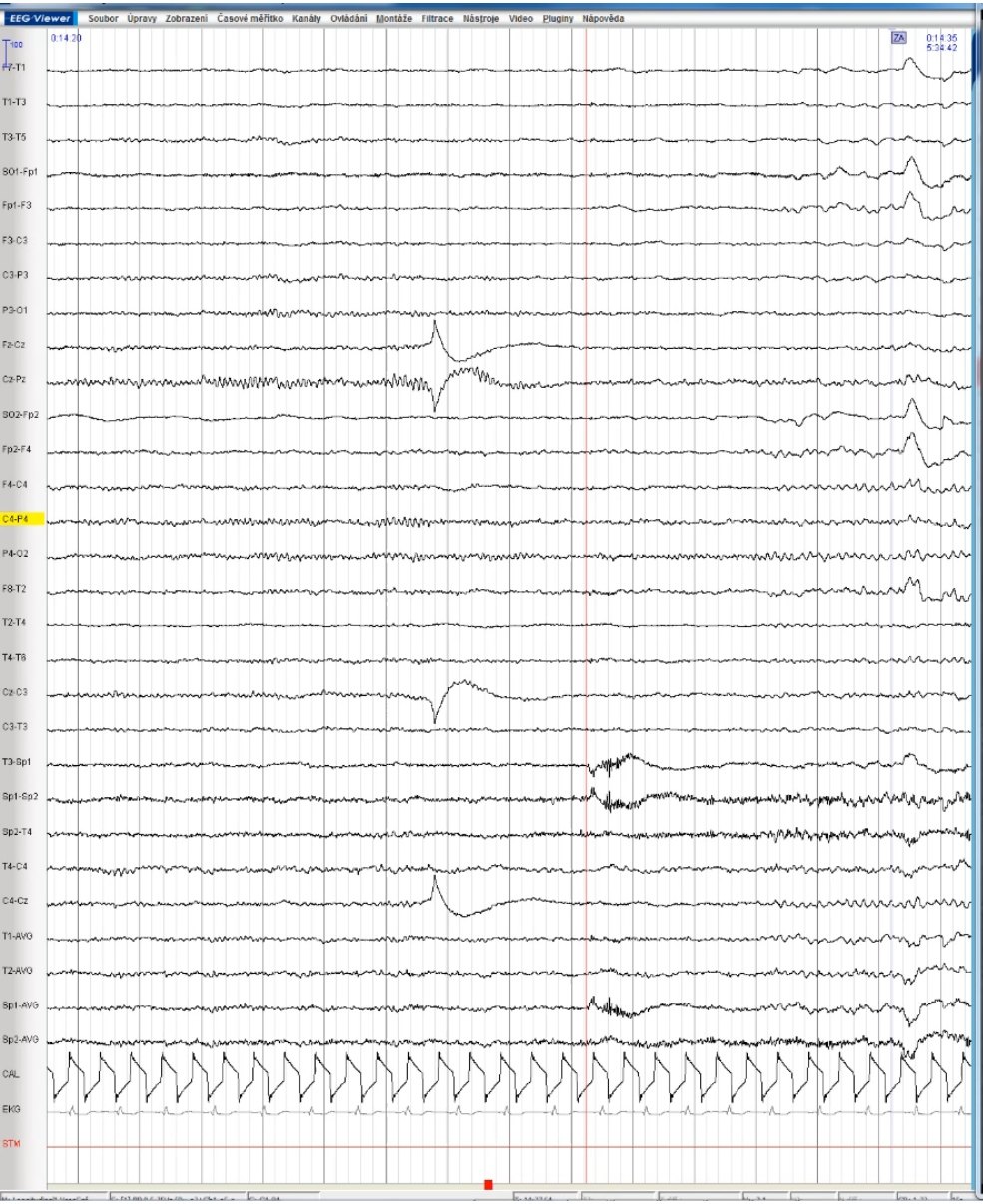
UCB, Eisai, Novartis, Sandoz, LivaNova, and Medtronics

• **Understanding of the seizure symptomatology** (i.e. knowledge of variable ictal phenomena and their potential localizing and lateralizing value) is crucial for **correct history taking** as well as for **visual analysis of epileptic seizures** (observed accidentally at the out-patient departments/neurological wards or intentionally at the video-EEG monitoring units).

• The **precise assessment of ictal semiology** and its chronology (the order of appearance of symptoms during the sz) importantly **increase the quality of the diagnostic conclusion** → better therapy.

Temporal lobe epilepsy

- **The most common type** of focal epilepsies
- Typical manifestation – **focal impaired awareness seizure** (previously CPS), rarely focal aware seizure (previously SPS) and occasionaly focal to bilateral TCS (previously sGTCS)
- Seizure duration **> 30 seconds**
- **Auras** (~90% of patients), **postictal confusion**, and amnesia for ictal period are common in TLE sz.
- In approx. 1/2 of patients = „behavioral arrest“ ☑


EEG-Viewer
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0:14:20
Fz-T1
T1-T3
T3-T5
SO1-Fp1
Fp1-F3
F3-C3
C3-P3
P3-O1
Fz-Cz
Cz-Pz
SO2-Fp2
Fp2-F4
F4-C4
C4-P4
P4-O2
F8-T2
T2-T4
T4-T6
Cz-C3
C3-T3
T3-Sp1
Sp1-Sp2
Sp2-T4
T4-C4
C4-Cz
T1-AVG
T2-AVG
Sp1-AVG
Sp2-AVG
CAL
EKG
STM


EEG time: 0:14:28

Ictal symptoms in TLE

- **Autonomic phenomena**
- **Psychic phenomena**
- **Motor phenomena** (incl. automatisms)

- Other phenomena - *dizziness* (sz originating from the TPO junction), vaguely described *feeling of discomfort* (AH complex, rarely lateral temp. neocortex), *aphasia* (dominant hemisphere), *ictal speech* (nondominant hemisphere), *somatosensory symptoms (rare, mostly affecting both hands, usually of opercular/insular origin),*

….

Autonomic phenomena

Epigastric aura (rising epigastric sensation), nausea, belching - **operculo-insular region**, hippocampus, parahipp gyrus, uncinate g, amygdala, GTM, post GTI, TPJ

Ictal retching/vomiting – szs involving (nondominant) opercular reg

Tachycardia, palpitation, elevation of blood pressure, flushing, skin pallor, „cephalic aura“ - heat in the head - amygdala, CA, temporal operculum

Irregular breathing – cornu Ammonis

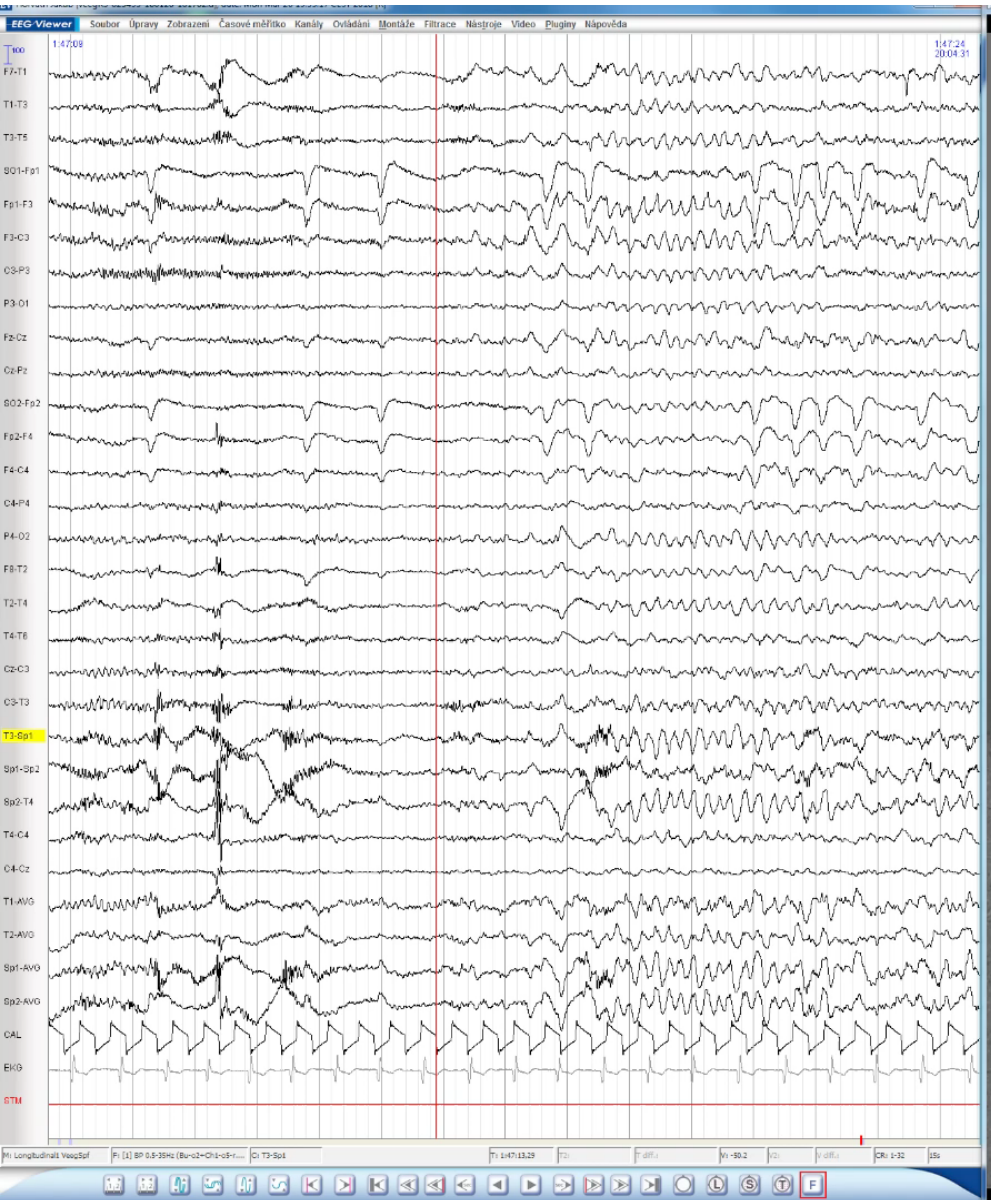
Ictal urinary urge – nondominant temporal lobe

Unilateral piloerection – ipsilateral ? right temporal lobe?

Bilateral or contralateral mydriasis – hipp, amy, temp.operculum

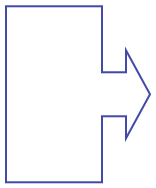
Peri-ictal water drinking - nondominant temporal lobe

Ictal bradycardia and asystole – more frequent in left TLE



Psychic phenomena

- Mnestic troubles
- Cognitive troubles
- Affective troubles



"Intellectual aura"

- Hallucinations and illusions (**olfactory, gustatory, auditory**, and visual)

(simple, complex)

Intellectual aura

• **Dreamy states** (alteration of the pts perception of time and memory processes)

• **Illusion déjà vu** (already seen), **entendu, vécu**

• **Illusion du jamais vu** (familiar surroundings may look unfamiliar), **entendu, vécu**

• Depersonalization, derealization

• Experiential phenomena – create in pts mind experiences, usually from his personal life, that have a compelling immediacy similar or more vivid than those occuring in real life.

• Mental diplopia

Affective troubles - negative

- **Fear** (frequent aura, described as „anxiety, fear or terror, a feeling like I am about to die“. Often it is accompanied by a fearful expression and vegetative sympt.).

It reflects *activations of key nodes within large-scale neural network: Amygdala – anterior cingulate ctx - orbitofrontal ctx – mesial temporal structures*

  - 1/ **Mesiotemporal type**
  - 2/ **Temporo-frontal type** (spreading T→F, but also F→T) – uncontrollable terror with hypermotor seizure

- Agression
- Depression
- Crying (dacrystic seizures)

Affective troubles - positive

- Joy
- Pleasure
- Laughter (gelastic seizures)

  1/ **Temporal type** - natural, > 30 sek, + loss of consciousness and vegetative signs *(temporobasal ctx - amygdala - hippocampus - hypothalamus)*

  2/ **Frontal type** – unnatural (grimacing), < 30 sek, + motor symptomatology *(gyrus cinguli ant.), consciousness can be preserved*

- Ecstasy (Dostoyevski´s aura)

Motor phenomena I

Automatisms

Oroalimentary (*chewing, swallowing, lip smacking, tongue movements*, …) - tend to occur in the early part of the seizure!

Ictal spitting – ictal discharges in nondominant temporal lobe

Ictal oroalimentary automatisms with preserved consciousness – unilateral involvement of nondominant temporal lobe

Excessive salivation - temporal operculum

Hand (simple discrete or bimanual movements – gestural) (stereotyped repetitive movements). Gestural automatisms of the legs (bicycling or pedaling) are late – spreading to mesial frontal ctx

Unilateral automatisms − ipsilateral; But RINCH contralateral!

Ambulatory (*sitting up, getting out of bed - ipsi, walking,*…)

Motor phenomena II

Dystonic posturing involving the upper limb – contralateral to the ictal discharge

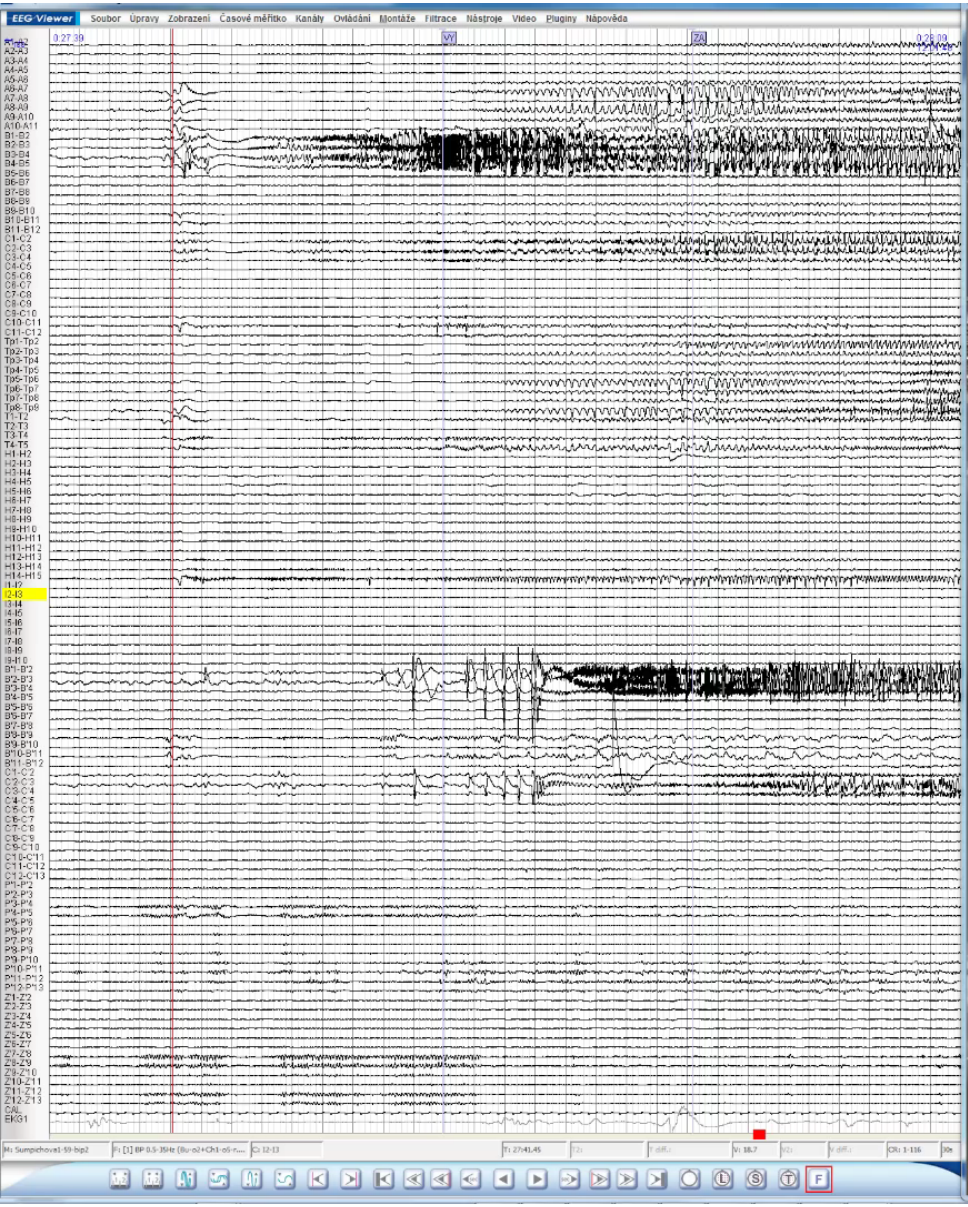
Tonic posturing – contralateral

Unilateral ictal immobility – contralateral (accompanied by automatisms in the opposite extremity)

Nonversive head turning (early sign) – ipsilateral

Head version (forced tonic deviation; late sign) - contralateral

Nose wiping (postictal, ictal) – ipsilateral


EEG Viewer
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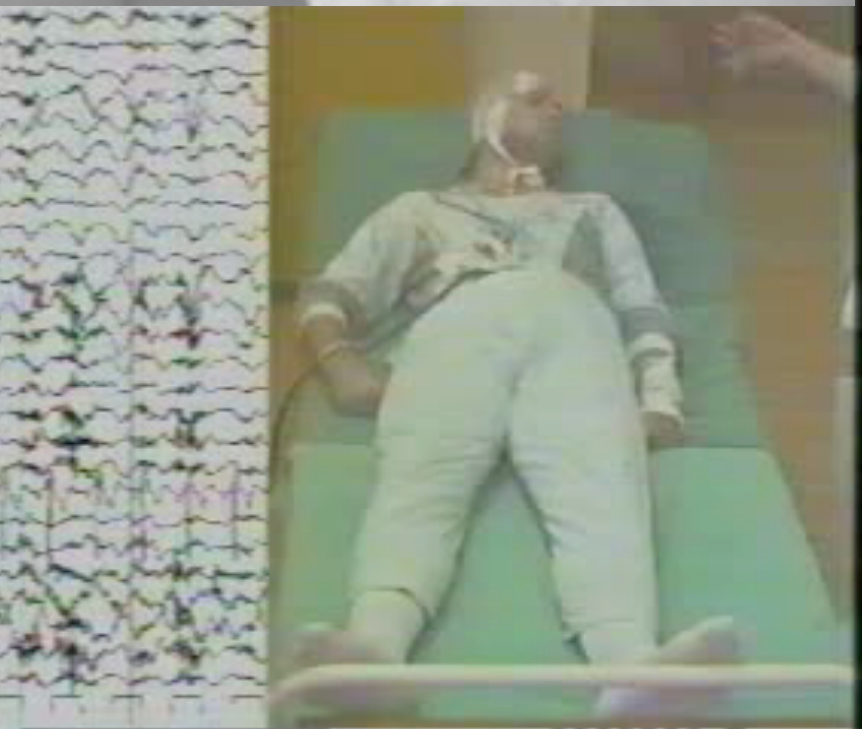


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Question

1/ Right-sided frontal lobe epilepsy

2/ Left-sided temporal lobe epilepsy

3/ Right-sided temporal lobe epilepsy

4/ Left-sided insular lobe epilepsy

- ✓ OA automatisms with preserved consciousness
- ✓ Verbalization
- ✓ Left-sided arm weakness/ hypokinesia
- ✓ Right-sided hand automatisms
- ✓ Ictal dysprosody/elevated pitch
  Peters et al, *Neurology* 2011
- ✓ Left-sided hand dystonic posturing

An epileptic seizure remains a complex multidimensional dynamic event and the analysis of clinical symptoms has to consider the time of appearance of a symptom within the seizure and the duration, i.e., the sequence of symptoms.

Sequence of clinical manifestations in mesial temporal lobe seizures

BEHAVIORAL ARREST

OROALIMENTARY AUTOMATISMS

LOOKING AROUND

WHOLE BODY MOVEMENTS

Two or more symptoms in this sequence were seen in about 77% of FIAS/CPS.

Conclusions

There is no doubt that many clinical seizure characteristics can provide important *lateralizing and localizing information*

The clinical semiology must, however, be taken in context with all other findings.

The *context* and the *sequence* of ictal signs are more important than a pure catalogue of symptoms!

SafeBrain

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