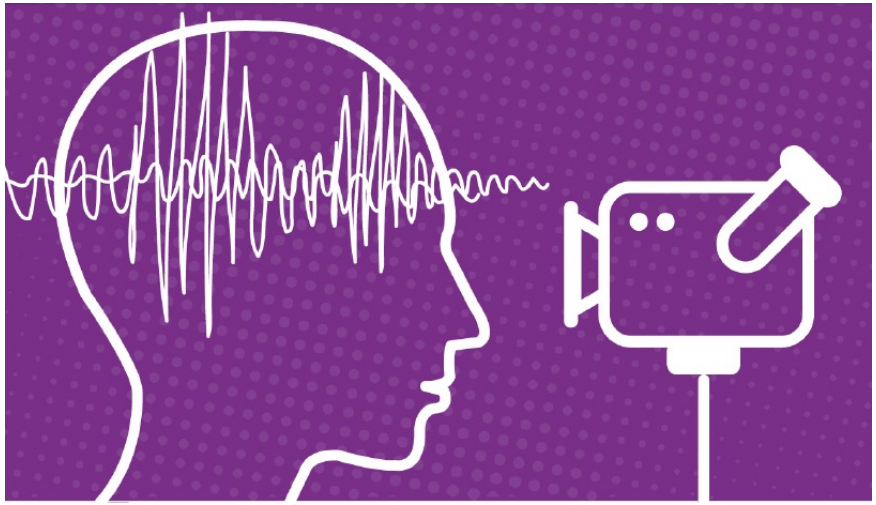

CORSO VIDEO EEG LICE
3° EDIZIONE
CATANIA, 24-27 OTTOBRE 2021

LICE Lega Italiana Contro l'Epilessia

fondazione epilessia LICE

LE CRISI E LE EPILESSIE DEL LOBO FRONTALE

Domenica 24 ottobre

Moderatori:
Roberto Biondi (Catania) – *Vittoria Cianci* (Reggio Calabria)

12:30	Registrazione dei partecipanti e pranzo di benvenuto
14:00 – 15:00	Anatomia funzionale del lobo frontale *Giuseppe Bertini* (Verona)
15:00 – 16:00	Storia dell'epilessia del lobo frontale *Paolo Tinuper* (Bologna)
16:00 – 16:40	Interpretazione del segnale EEG *Oriano Mecarelli* (Roma)
16:40 – 17:00	*Pausa*
17:00 – 18:00	Tecniche di registrazione e interrogatorio *Carmen Barba* (Firenze) – *Valentina Chiesa* (Milano)
18:00 – 18:30	La refertazione: metodi e utilità *Veronica Pelliccia* (Milano)

Dichiarazione sul Conflitto di Interessi

Dichiaro che negli ultimi due anni ho avuto i seguenti rapporti anche di finanziamento (compensi per relazioni/moderazioni a Congressi, FAD, Expert Meeting, etc) con soggetti portatori di interessi commerciali in campo sanitario:

- Arvelle/Angelini
- BIAL
- EISAI
- GW
- Lusofarmaco
- Sanofi
- UCB

O. Mecarelli (7.10.2021)

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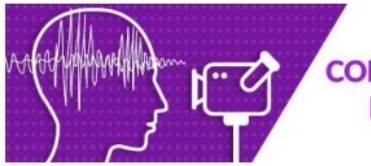

CORSO VIDEO EEG LICE - 1° EDIZIONE
BOLOGNA, 2 - 5 OTTOBRE 2016

Domenica 2 ottobre - La Video-EEG in epilettologia

Lunedì 3 ottobre - La Video-EEG nell'età evolutiva

Martedì 4 ottobre - La Video-EEG nelle epilessie focali

Mercoledì 5 ottobre - La video EEG nelle emergenze epilettologiche

CORSO VIDEO EEG
LICE – 2° EDIZIONE
BOLOGNA, 1 - 4 OTTOBRE 2017

LE CRISI E LE EPILESSIE DEL LOBO TEMPORALE

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Contro l'Epilessia

Epileptic Disord, Vol. 19, No. 3, September 2017

M. Koutroumanidis, *et al.*

Epileptic Disorders

The Educational Journal of the International League Against Epilepsy

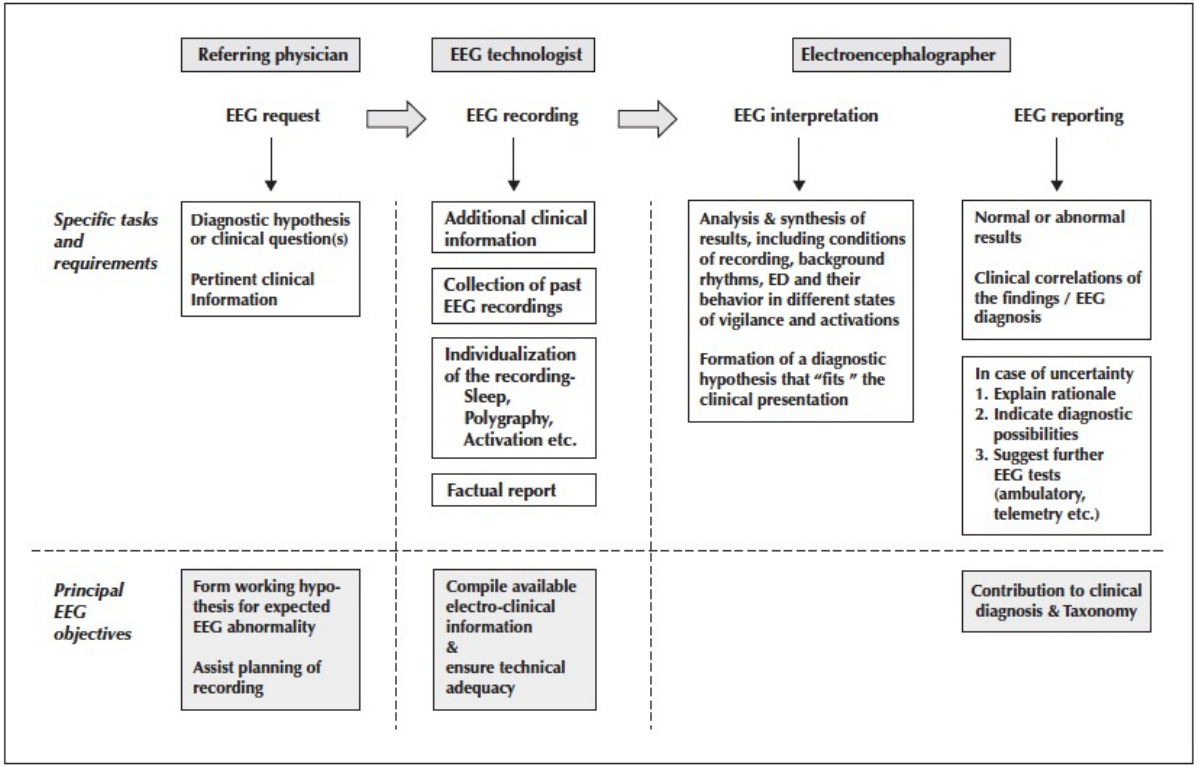
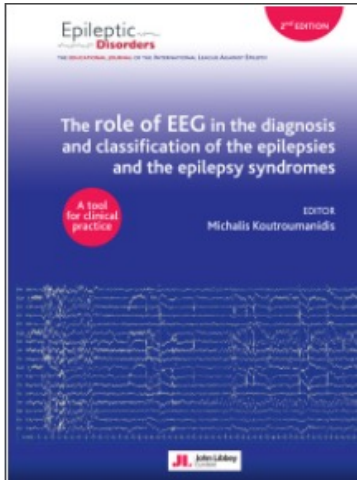


Figure 1.01. EEG diagnostic pathway; from the initial referral to the final report. The white boxes in the upper row show the main tasks and requirements in each stage of the orderly EEG process from the initial request to the final report to maximize its diagnostic contribution. For example, individualization of the recording relies on the completeness of the diagnostic hypothesis of the referring physician and the provided clinical information on the request form, but also on additional information obtained by the EEG technologist (*see section 1.4 in the text*). The grey boxes in the lower row show the main objectives of each stage of the EEG process, culminating in the important role of the EEG in clinical diagnosis and taxonomy.



INVITED REVIEW

Misdiagnosi Epilessia: > 25% dei casi

The Role of EEG in the Erroneous Diagnosis of Epilepsy

Ushtar Amin and Selim R. Benbadis

Department of Neurology, University of South Florida, Tampa, Florida, U.S.A.

Summary: Errors in diagnosis are relatively common in medicine and occur in all specialties. The consequences can be serious for both patients and physicians. Errors in neurology are often because of the overemphasis on "tests" over the clinical picture. The diagnosis of epilepsy in general is a clinical one and is typically based on history. Epilepsy is more commonly overdiagnosed than underdiagnosed. An erroneous diagnosis of epilepsy is often the result of weak history and an "abnormal" EEG. Twenty-five to 30% of patients previously diagnosed with epilepsy who did not respond to initial antiepileptic drug treatment do not have epilepsy. Most patients misdiagnosed with epilepsy turn out to have either psychogenic nonepileptic attacks or syncope. Reasons for reading a normal EEG as an abnormal one include over-reading normal variants or simple fluctuations of background rhythms. Reversing the diagnosis of epilepsy is challenging and requires reviewing the "abnormal" EEG, which can be difficult. The lack of mandatory training in neurology residency programs is one of the main reasons for normal EEGs being over-read as abnormal. Tests (including EEG) should not be overemphasized over clinical judgment. The diagnosis of epilepsy can be challenging, and some seizure types may be underdiagnosed. Frontal lobe hypermotor seizures may be misdiagnosed as psychogenic events. Focal unaware cognitive seizures in elderly maybe be blamed on dementia, and ictal or interictal psychosis in frontal and temporal lobe epilepsies may be mistaken for a primary psychiatric disorder.

Key Words: Seizures, Epilepsy, Misdiagnosis, EEG.

(J Clin Neurophysiol 2019;36: 294–297)

Eur J Neurosci. 2021;1–11.

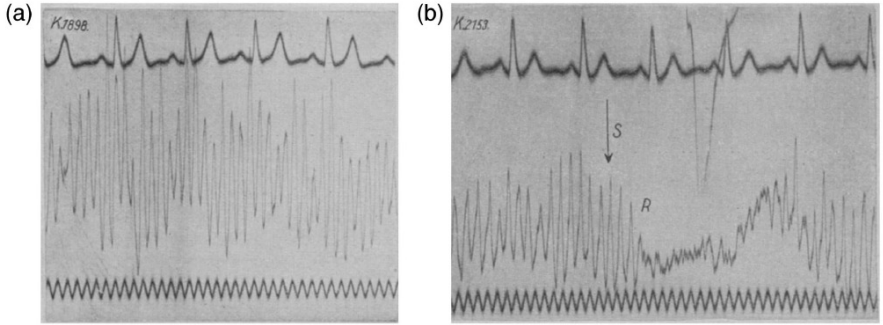


FIGURE 1 Sample recordings by Hans Berger from a family member and a patient. (a) Figure 3 in Berger (1935a): 'J.B., 14 years old'. Typical of his earlier work, the electrocardiogram is depicted in the top trace, and a time trace showing 1/10 s is shown below. The centre trace is the EEG, here recorded using silver chloride needle electrodes in a bipolar montage on forehead and occiput. (b) Figure 4 in Berger (1935a): 'M.M., 33 year old man. Large gap in the skull from the left forehead to the parietal region.' Here, the EEG was recorded epidurally using silver chloride needle electrodes placed 4.5 cm apart inside the gap in the skull. At the time marked with the arrow and S, a needle was briefly inserted into the patient's left index finger. R indicates the subsequent extinction of alpha. [Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer Nature, Naturwissenschaften (Das Elektrenkephalogramm des Menschen, Hans Berger), Copyright © 1969, Verlag von Julius Springer (1935)]

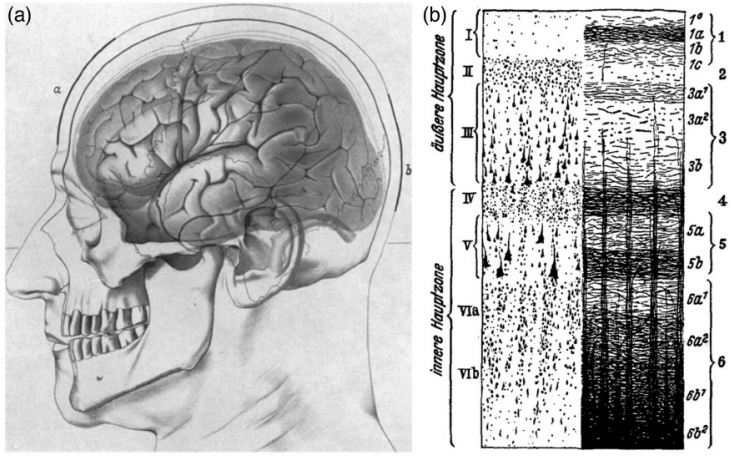


FIGURE 2 Examples of the exquisite illustrations that can be found in older literature. (a) Figure 10 from Berger (1938): 'Location of silver foil electrodes a and b above forehead and occiput.' These were Berger's favoured locations for his bipolar electrode montage, as they led to alpha rhythms of greatest amplitude. [Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer Nature, Archiv für Psychiatrie und Nervenkrankheiten (Über das elektrenkephalogramm des menschen. XIV Mitteilung, Hans Berger), Copyright © 1938, Verlag von Julius Springer (1938)]. (b) Figure 4 from Berger (1937a) illustrating the separation of cortex into superficial (äußere Hauptzone) and deep (innere Hauptzone) layers. Berger theorized about laminar differences in alpha and his beta waves in a detailed table in the same publication. [Reprinted by permission from Springer Nature Customer Service Centre GmbH: Springer Nature, Naturwissenschaften (Das Elektrenkephalogramm des Menschen und seine Deutung, Hans Berger), Copyright © 1969, Verlag von Julius Springer (1937)]

S.I. 10-20, Jasper 1958

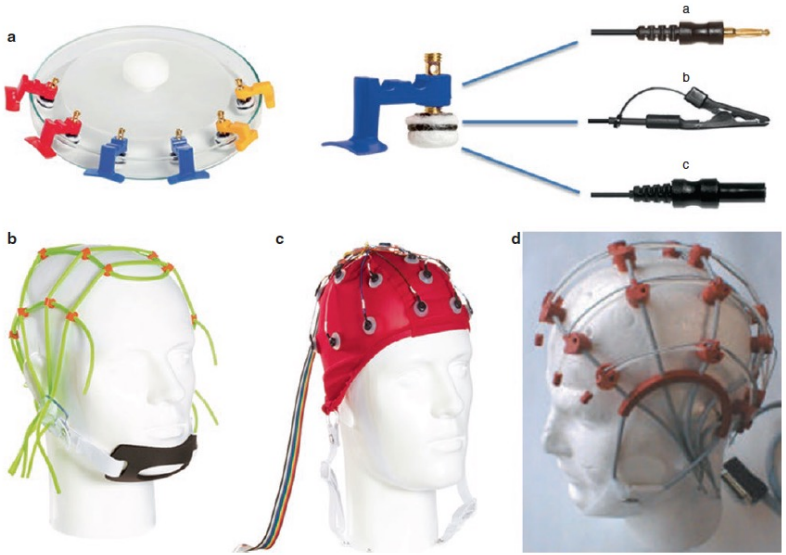
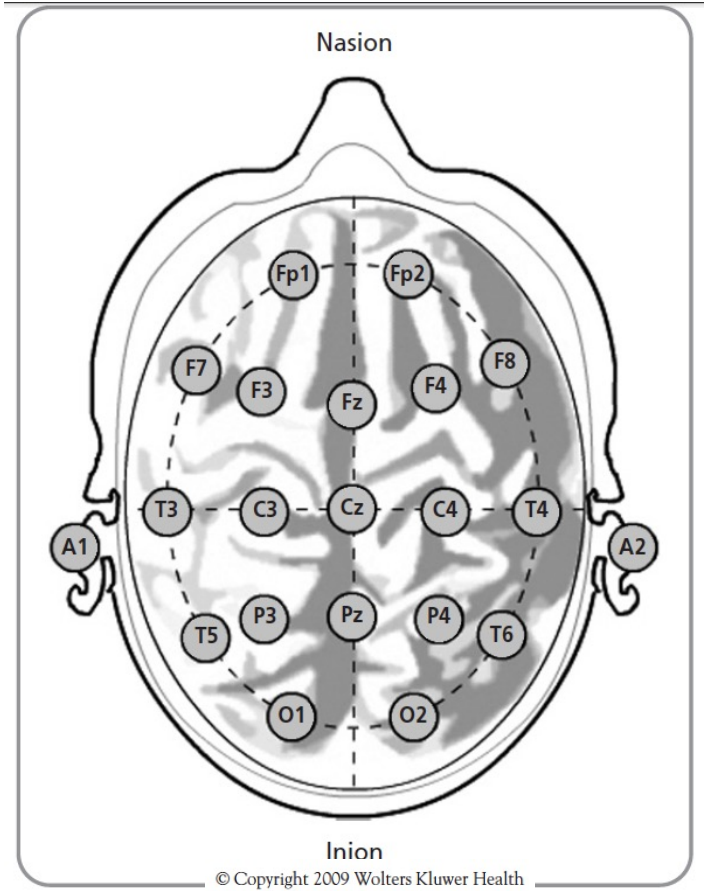


Fig. 3.1 (**a**) Bridge electrodes and their connectors: (*a*) spring plug; (*b*) alligator clip; (*c*) touch proof. (**b**) Cap with rubber bands for positioning bridge electrodes. (**c**) Prewired cap for standard EEG recording. (**d**) Elastic cap with electrodes pre-inserted in junctures

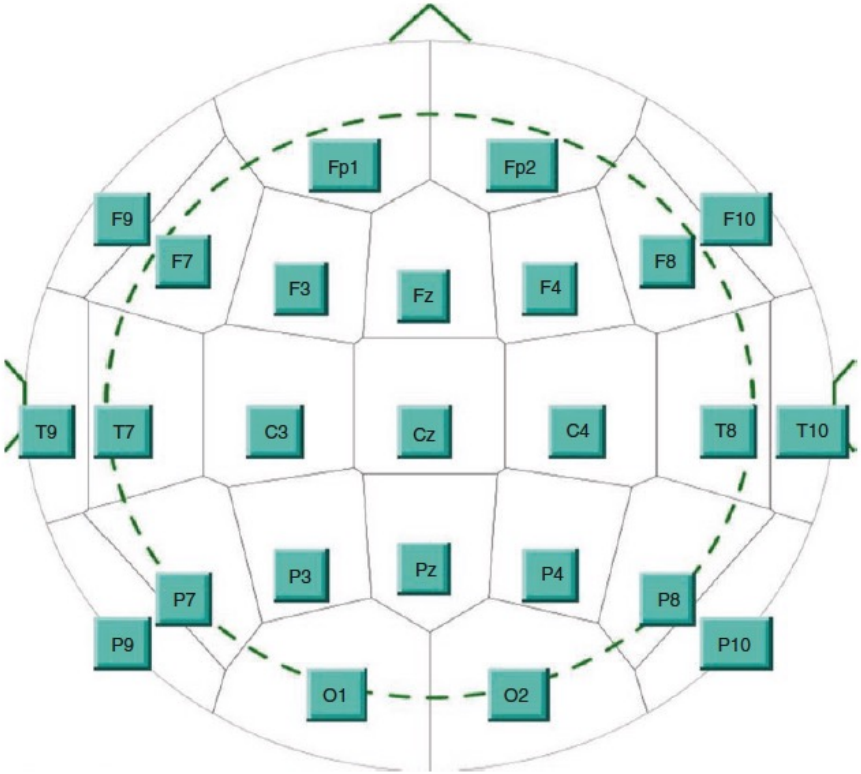
O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

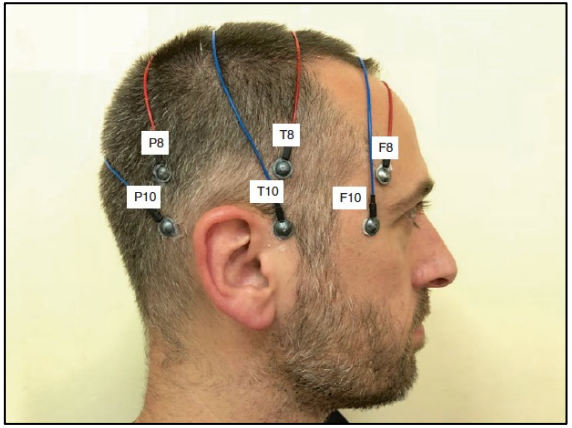


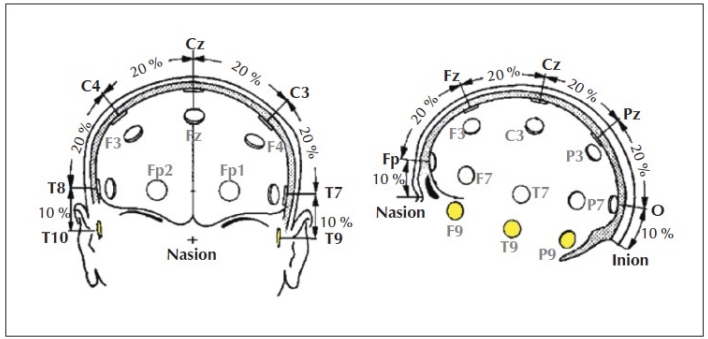
ISBN 978-88-7556-427-8

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

Fig. 4.3 New standard montage with additional coverage of the inferior and anterior brain regions, according to the recent recommendations of International Federation of Clinical Neurophysiology (from ref. [7], with permission)







Seeck M, Koessler L, Bast T, et al. The standardized EEG electrode array of the IFCN. Clin Neurophysiol. 2017;128:2070–7.

S. Beniczky, D.L. Schomer
Epileptic Disord, Vol. 22, No. 6, December 2020

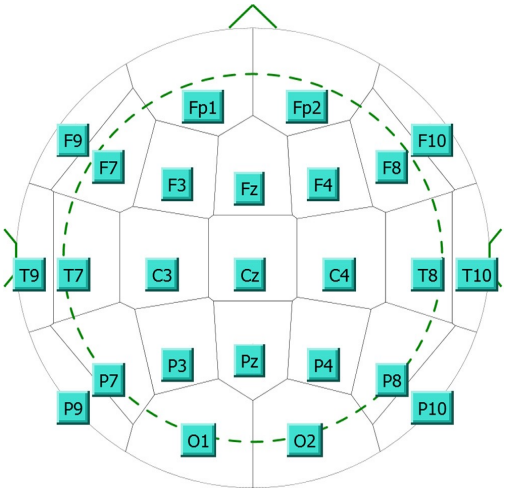
Clinical Neurophysiology 128 (2017) 2070–2077

Recommended standard set-up

Guidelines

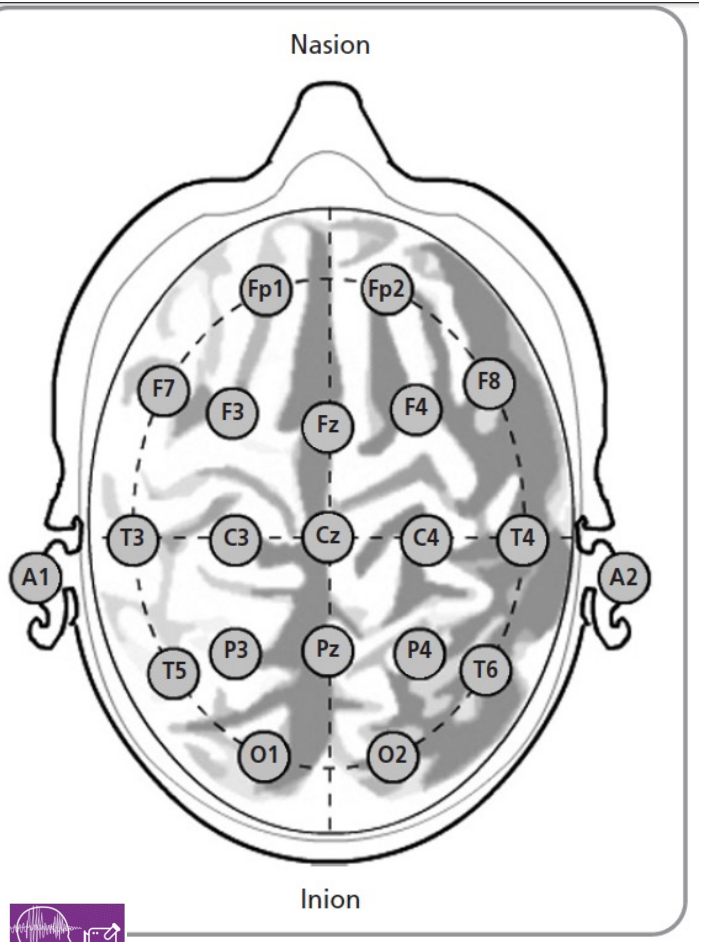
The standardized EEG electrode array of the IFCN

Margitta Seeck [a,*], Laurent Koessler [b], Thomas Bast [c], Frans Leijten [d], Christoph Michel [e], Christoph Baumgartner [g], Bin He [f], Sándor Beniczky [h]

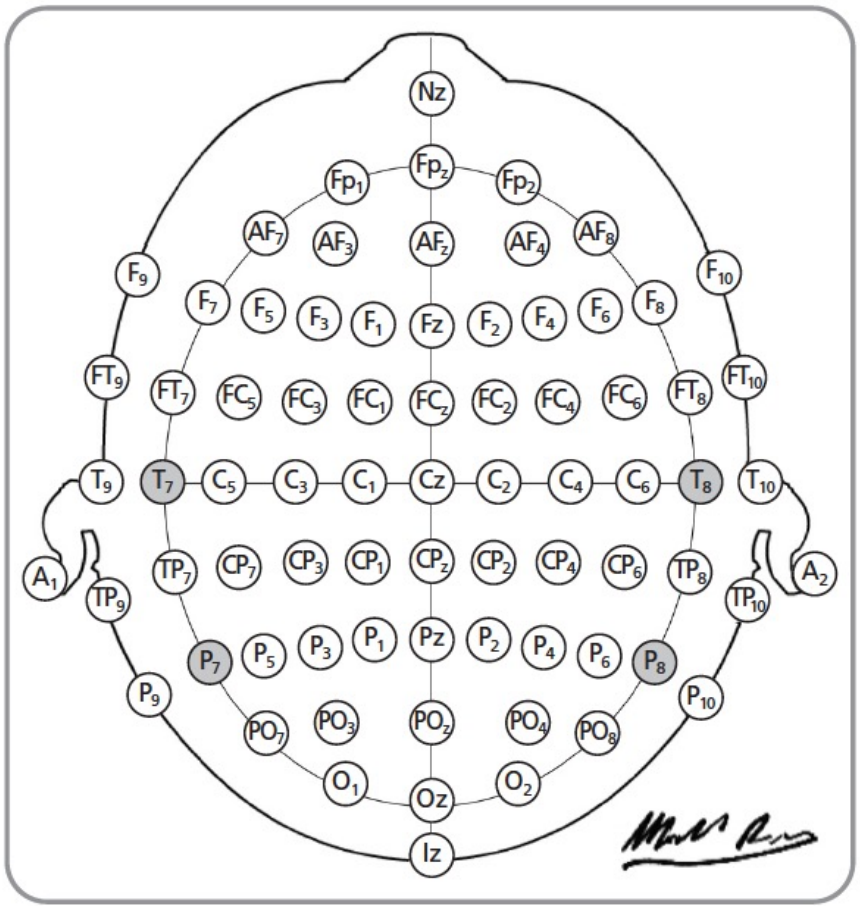


The standard 10–20 system did not include electrodes in the inferior chain (at the level of the preauricular point). Thus the inferior-basal and anterior part of the temporal lobe, which preferentially picks up activity originating or propagating from the mesial temporal structures, was not sampled (Rosenzweig et al., 2014; Koessler et al., 2015). Given that several diseases (e.g. temporal lobe epilepsy due to hippocampal sclerosis, autoimmune epilepsy, Alzheimer's disease) are characterized mainly by mesial temporal pathology, this region needs to be targeted through additional scalp electrodes in standard recordings. Thus, derived from the 10–10-system, we propose to add T9/T10 (10% inferior to T7/T8), F9/F10 (20% anterior to T9/10, or 10% inferior to F7/F8) and P9/P10 (10% inferior to P7/P8 or 20% posterior to T9/T10). The new basic array for clinical practice includes these six electrodes of the inferior temporal chain, which results in a total of 25 positions (Fig. 3). *For the reasons outlined above, we strongly recommend to use these 25 electrodes as a minimum for all standard recordings.*

S.I. 10-20



S.I. 10-10



Oriano Mecarelli
Manuale Teorico Pratico di Elettroencefalografia

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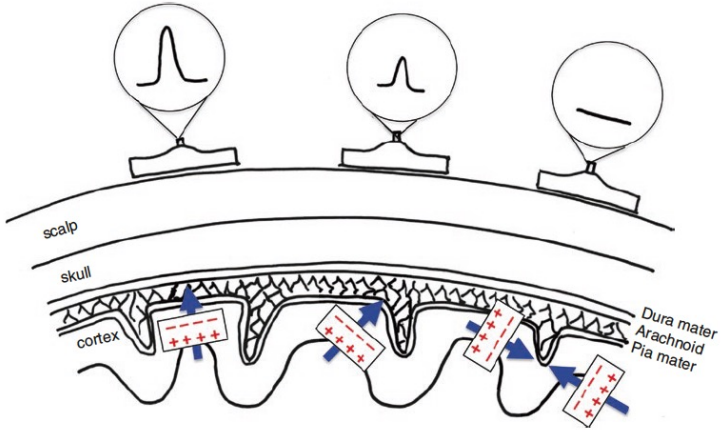

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

August 2019 | Volume 10 | Article 855

Taking the EEG Back Into the Brain: The Power of Multiple Discrete Sources

Michael Scherg[1], Patrick Berg[1], Nobukazu Nakasato[2] and Sándor Beniczky[3]*

[1] Research Department, BESA GmbH, Gräfelfing, Germany, [2] Department of Epileptology, Tohoku University, Sendai, Japan, [3] Department of Clinical Neurophysiology, Danish Epilepsy Centre, Aarhus University Hospital, Aarhus, Denmark

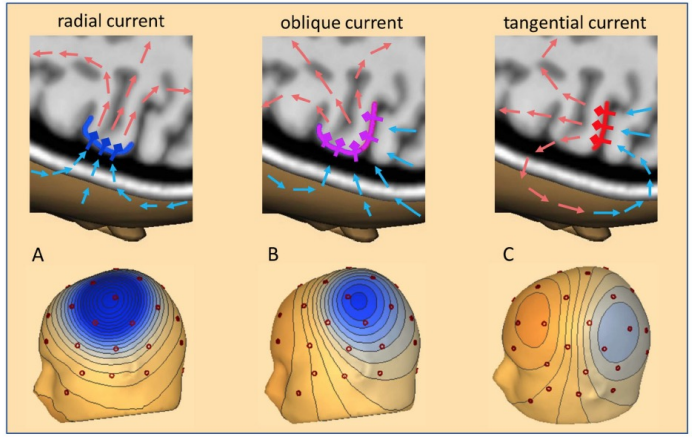

FIGURE 1 | Cortical currents, volume currents, and scalp topography. Three cases of IED current inflow into a focal cortical patch are illustrated: **(A)** radial (dark blue), **(B)** oblique (pink), **(C)** tangential (red). Pyramidal cells and their apical dendrites are symbolized by diamonds and thick outward bars. A subset of return current loops is depicted by arrows in light red to illustrate where they create positive and light blue where they create negative voltages. Depending on the net orientation of the cortical patch, the zone of maximal inflow from scalp into depth shifts from above the patch **(A)**, to more posterior **(B)** and fully posterior **(C)**. These currents create the typical 3D-voltage topographies on the scalp related to a focal IED at the cortical convexity **(A)**, in the depth of a sulcus **(C)**, and, the more common case of an oblique net current involving both superficial and sulcal cortex **(B)**.

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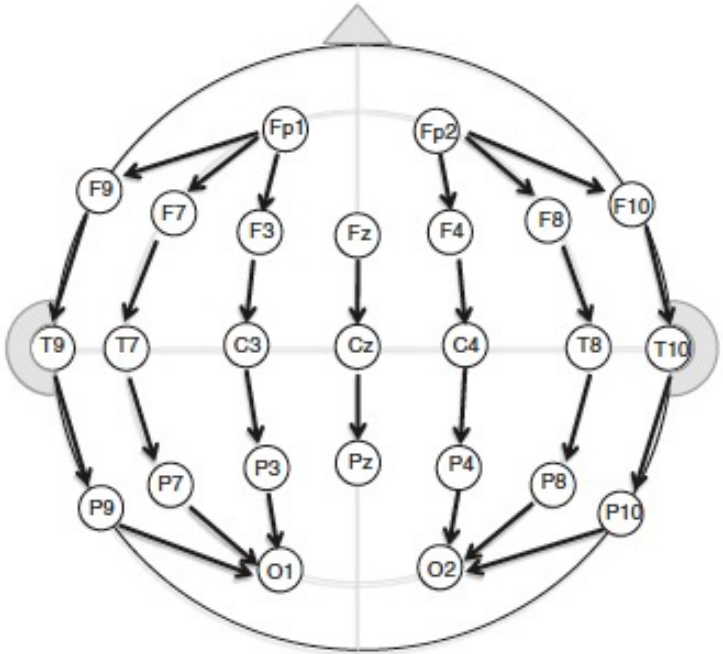

Fig. 4.19 New longitudinal bipolar montage proposed by International Federation of Clinical Neurophysiology (IFCN) [7]

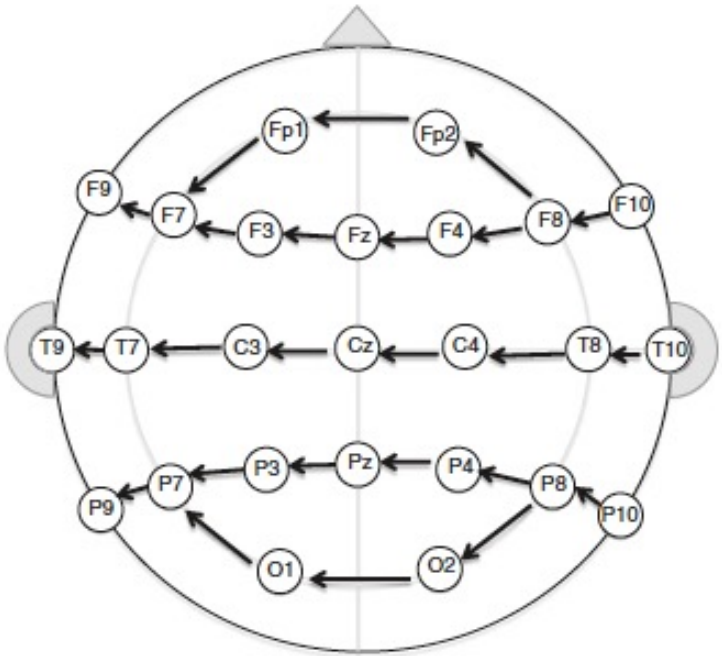

Fig. 4.20 New transverse bipolar montage proposed by International Federation of Clinical Neurophysiology (IFCN) [7]. Note that the interelectrode distance between the inferior and superior temporal electrodes is shorter (10%) compared to the other interelectrode distances (20%)

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

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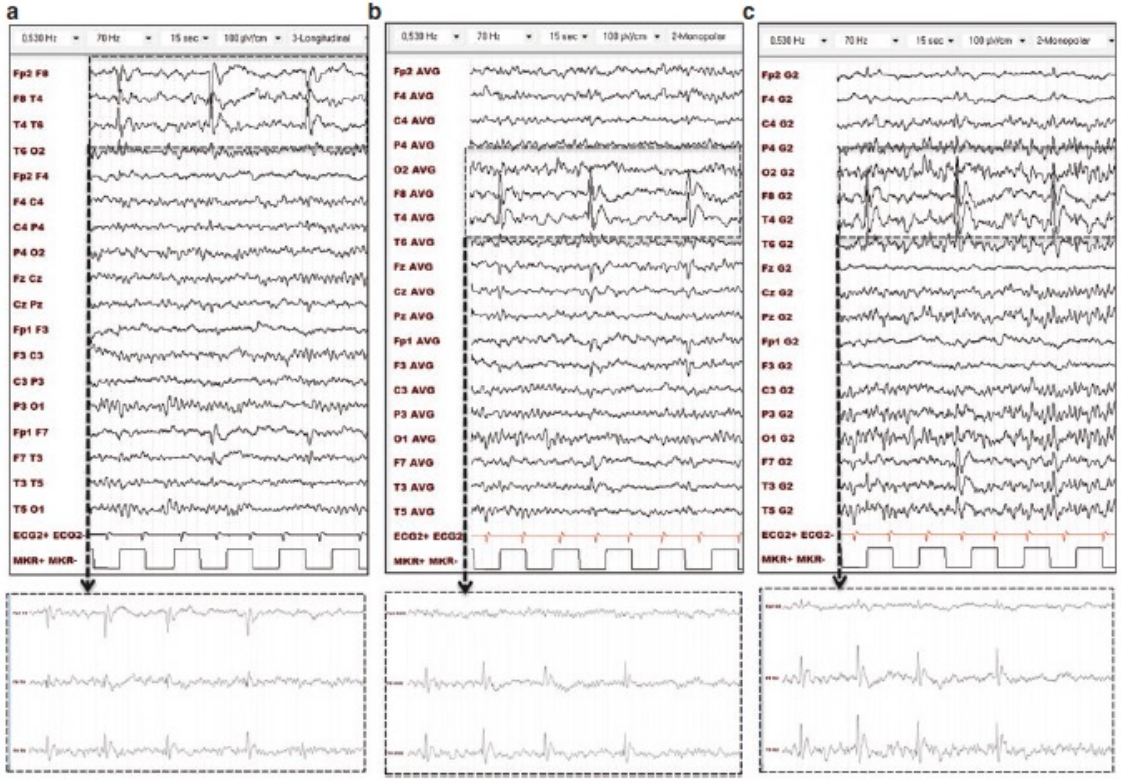
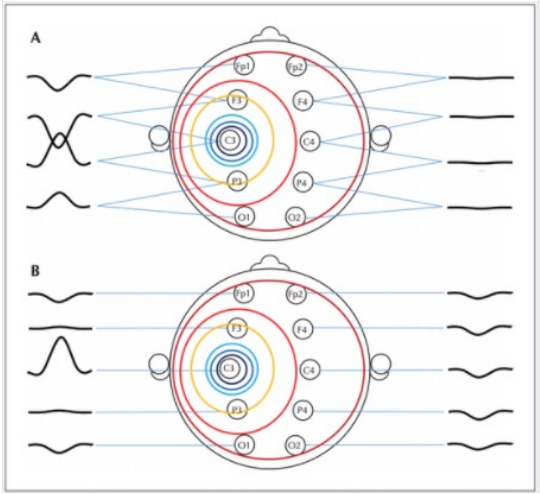


Fig. 4.17 The same EEG epoch of 5 s shows a right temporal epileptic focus in bipolar, AVG reference and common active reference derivations. In (**a**) (bipolar derivation) the phase reversal phenomenon in the first and third channel is evident, with almost total cancellation of the spikes in the intervening channel F8–T4 (these electrodes are placed over the focus and their potentials presumably have the same polarity and voltage as input to the differential amplifiers); note the poor spread of spikes to the homologous contralateral areas. The AVG reference derivation (**b**) confirms the higher negative signals at F8 and T4 electrodes; note, however, that positive signals are present also in Fz, Cz, Fp1 and F3, and negative in F7 and T3. When a common active electrode of reference is used (**c**) (G2, placed on midline in Fpz), the signal shows the same negative higher voltage in F8 and T4, with the evidence of synchronous lower negative signals contralaterally in F7, T3 and T5. However, in this practical example, all three derivations allow to localize the epileptogenic focus with good reliability (T4, T6, T3, T5 = T8, P8, T7, P7 according to the new nomenclature)



S. Beniczky, D.L. Schomer

Epileptic Disord, Vol. 22, No. 6, December 2020

31 elettrodi- bipolare

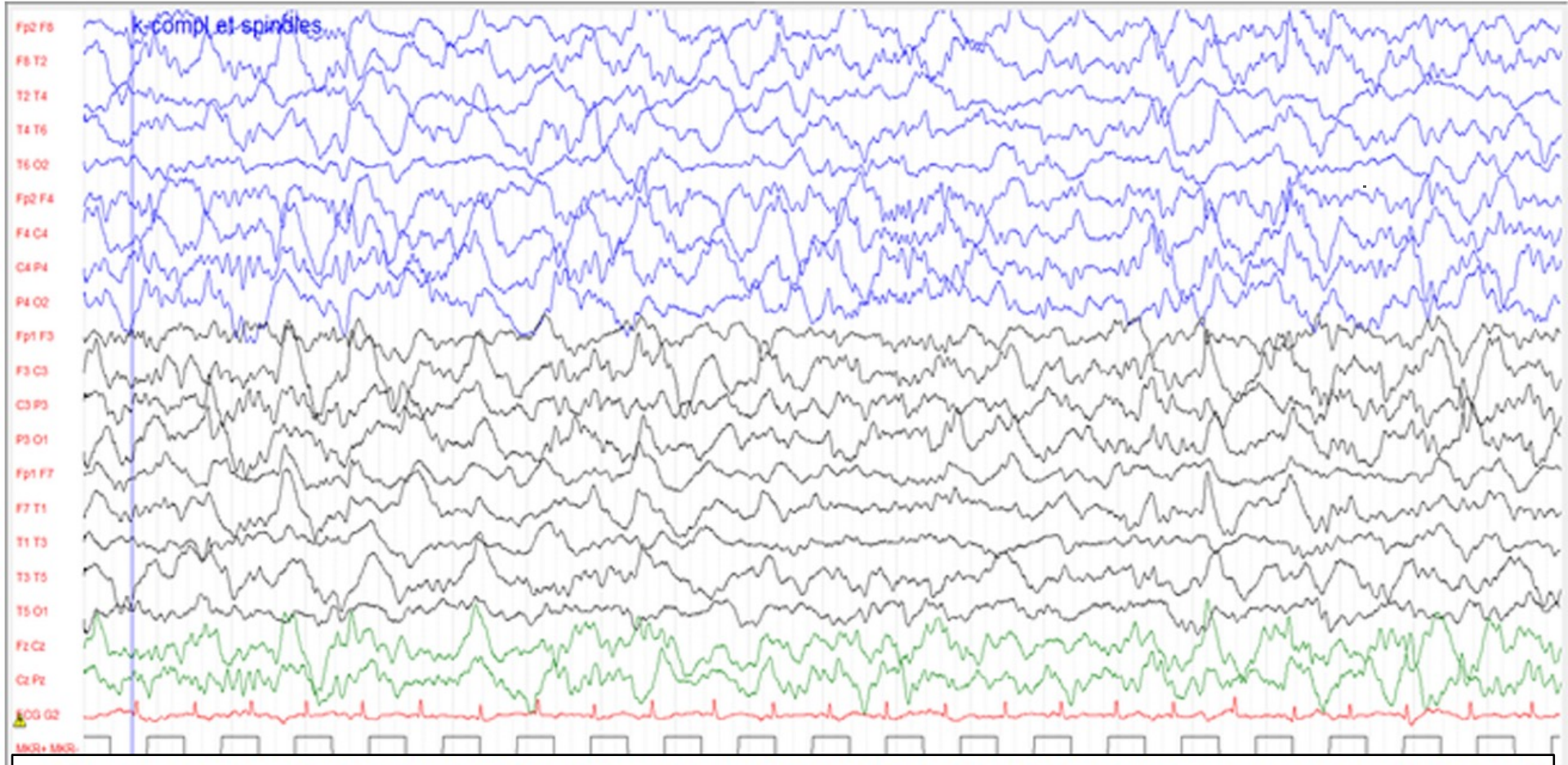


Fig. 4. Top: 11 year old boy with focal epilepsy. Negative scalp EEG, including sleep recordings using "double banana montage" from 31 scalp electrodes. I

31 elettrodi - AVG

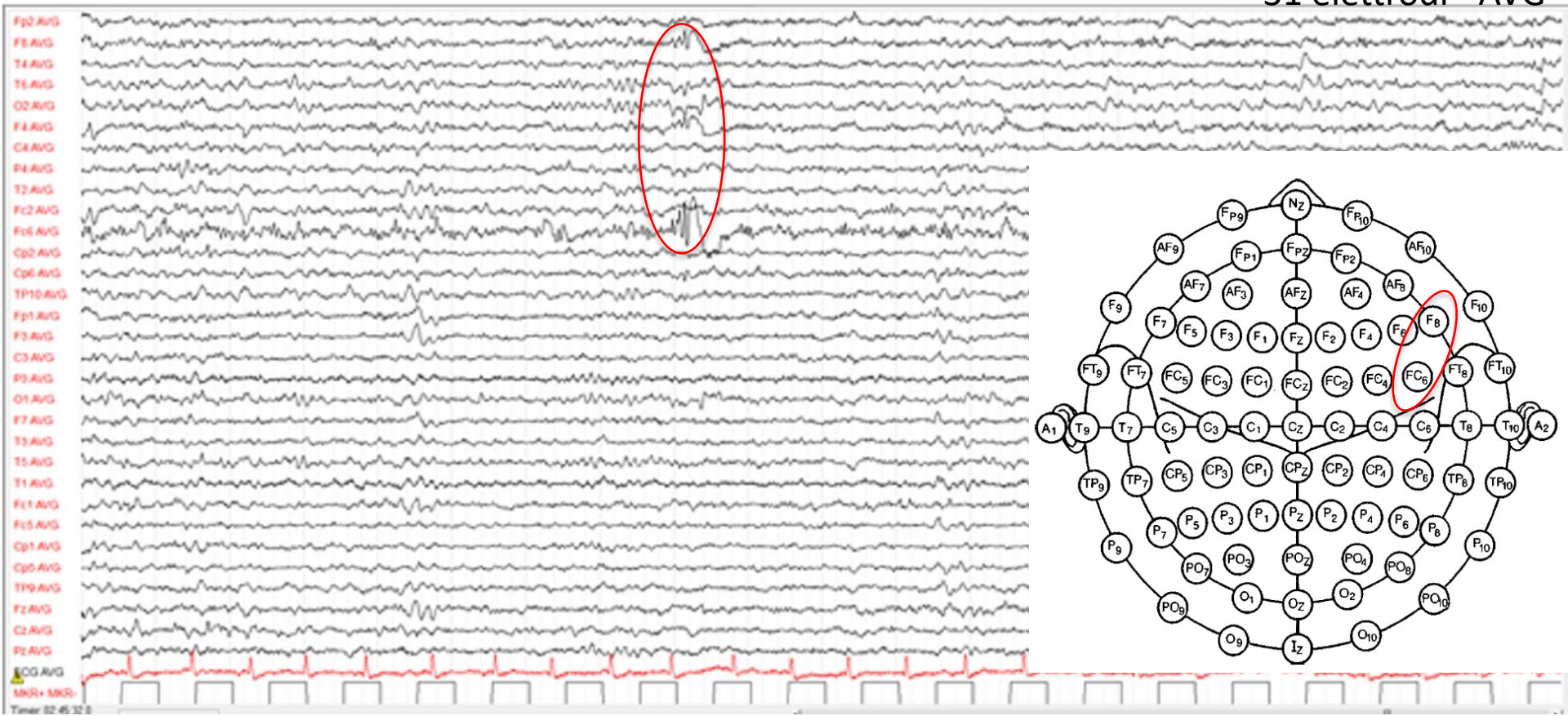


Fig. 4. Top: 11 year old boy with focal epilepsy. Negative scalp EEG, including sleep recordings using "double banana montage" from 31 scalp electrodes. Bottom: careful review of the monopolar montage (average reference) of the 31 electrodes showed a circumscribed focus, essentially restricted to FC6 with occasional spreading to F8. FC6 is not part of the usual clinical set-up which is why the epileptic focus was never seen in standard scalp recordings.

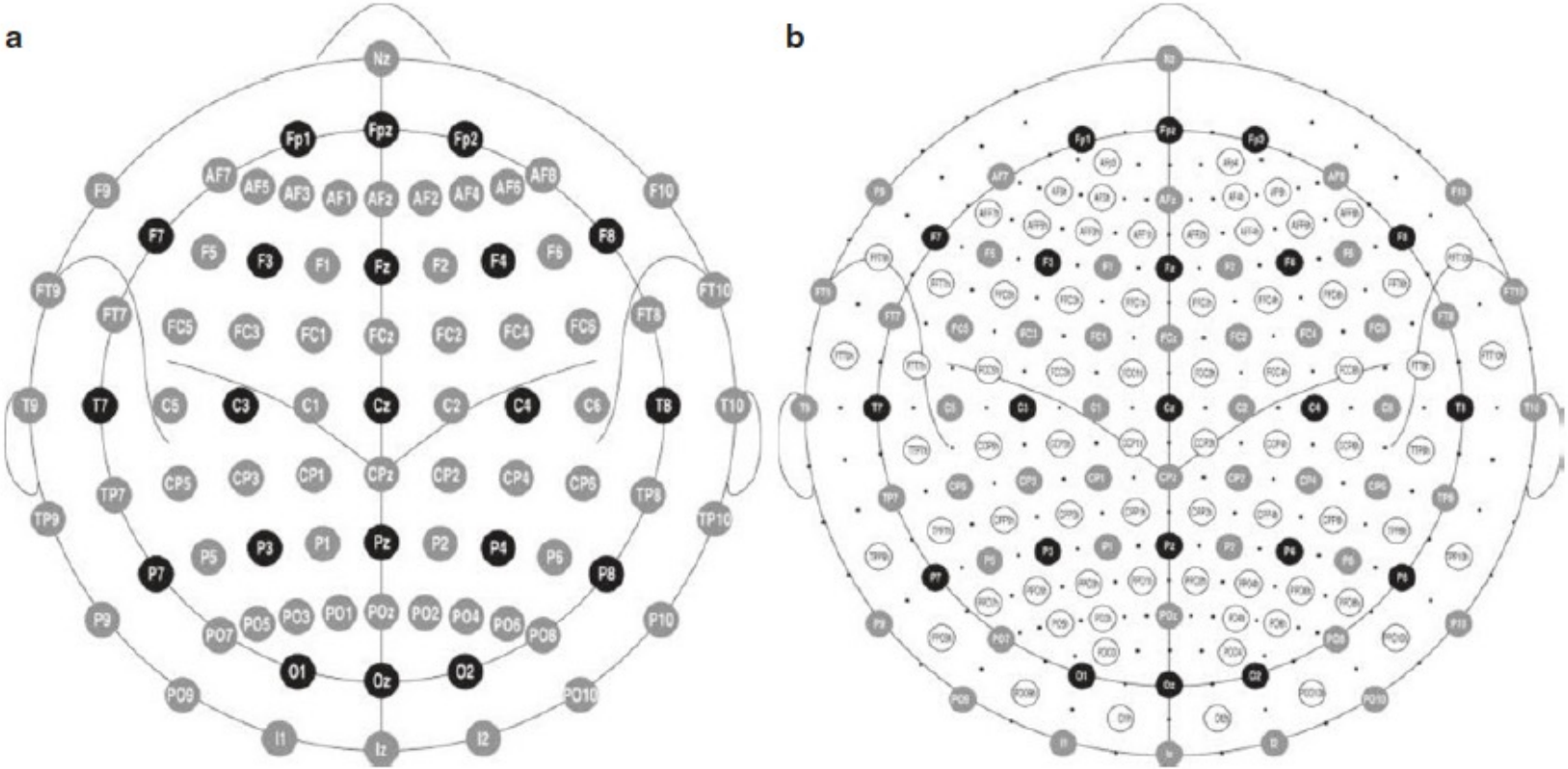


Fig. 4.5 The 10-10 and 10-5 extension of traditional 10-20 system. In (**a**) black circles indicate positions of the original 10-20 system and grey circles indicate additional positions introduced in the 10-10 extension. In (**b**) electrode positions in the proposed 10-5 system: additional positions to the 10-10 system are indicated with dots; a selection of additional positions useful for a 128 channel EEG system is indicated with open circles (from ref. [9], with permission)

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

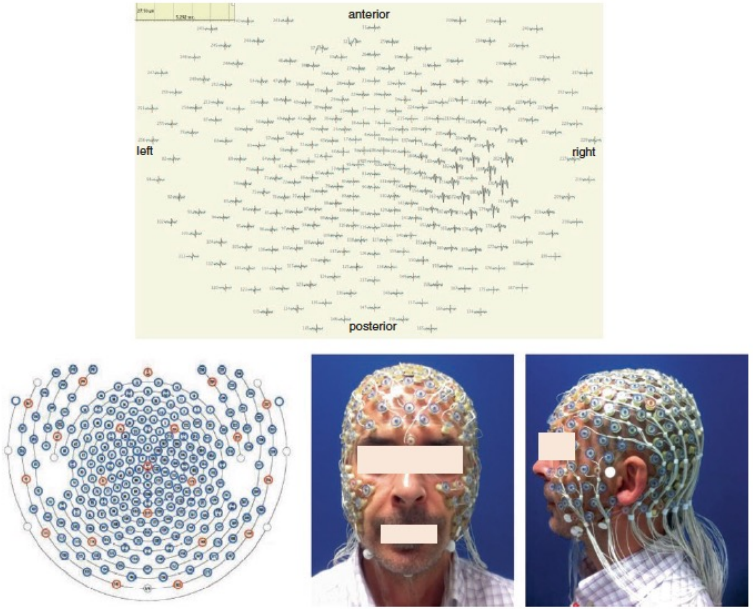


Fig. 4.6 An example of 256-channel high-density EEG, with projected locations of the electrodes on the scalp (courtesy from: Paolo Manganotti, Clinical Neurology Unit, University of Trieste—Italy)

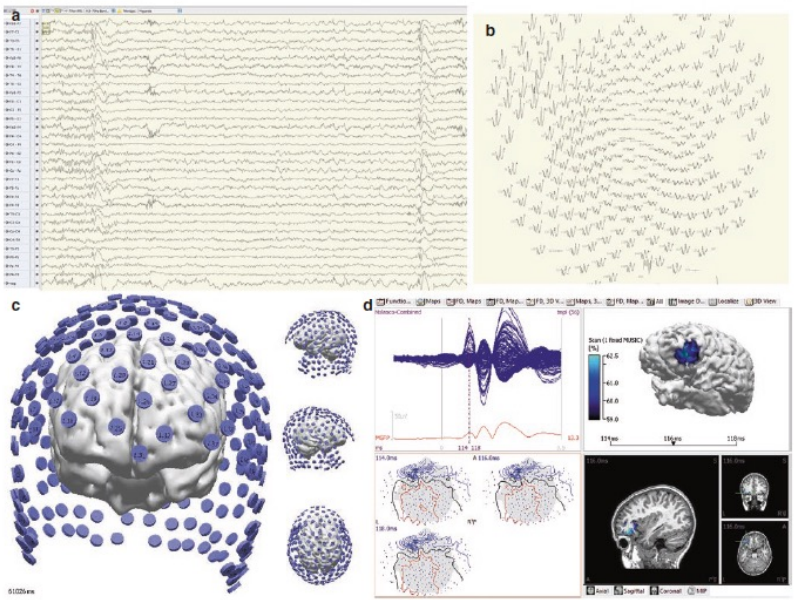


Fig. 4.7 Comparison of standard and high-density EEG in a patient with epileptic left temporal focus; (**a**) standard EEG recording with placement of electrodes according to 10-20 system; (**b**) recording of a single spike by 256 electrodes placed on the scalp; (**c**) the 256 placed electrodes projected onto a 3D image of the patient's brain, obtained by MRI; (**d**) source analysis of epileptic focus (56 spikes average) (courtesy from: Annalisa Rubino, Lino Nobili, Epilepsy Surgery Centre—Niguarda Hospital, Milan, and Child Neuropsychiatry, Department of Neurosciences, University of Genoa)

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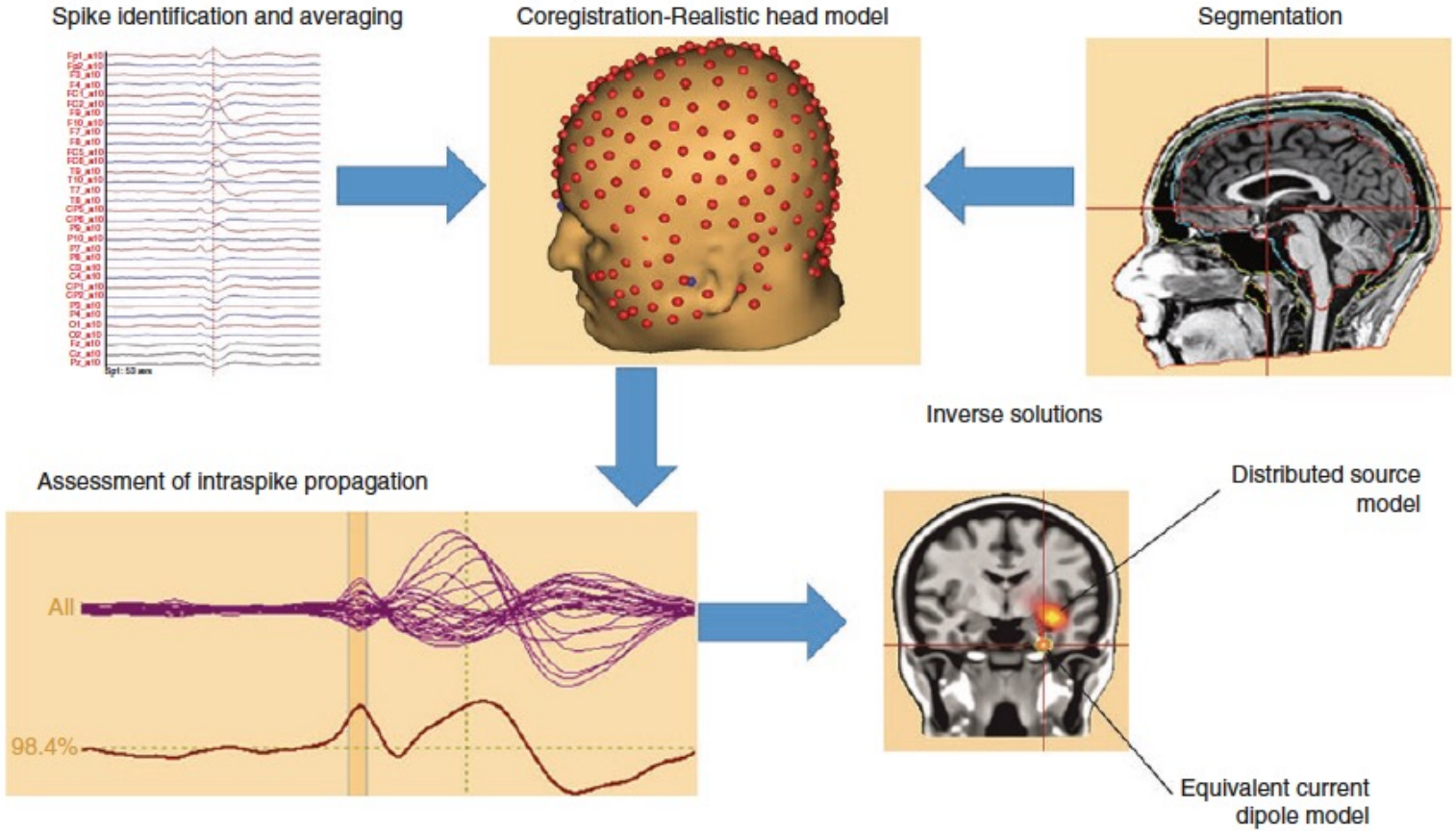

Fig. 20.11 Flowchart of the methodological steps of source imaging

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Elettrodi speciali: sfenoidali, zigomatici, naso-etmoidali, naso-faringei, timpanici, etc

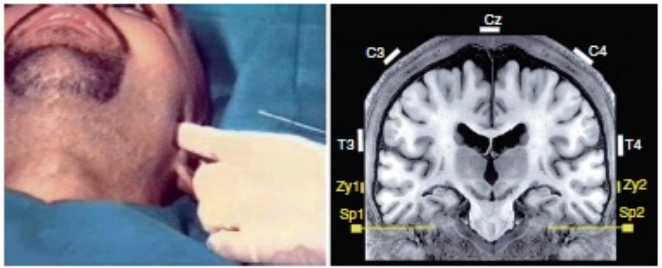

Fig. 3.5 Positioning of bilateral sphenoidal electrodes (courtesy of Francesca Bisulli and Paolo Tinuper, IRCCS Institute of Neurological Sciences, and Department of Biomedical and Neuromotor Sciences, University of Bologna, Italy)

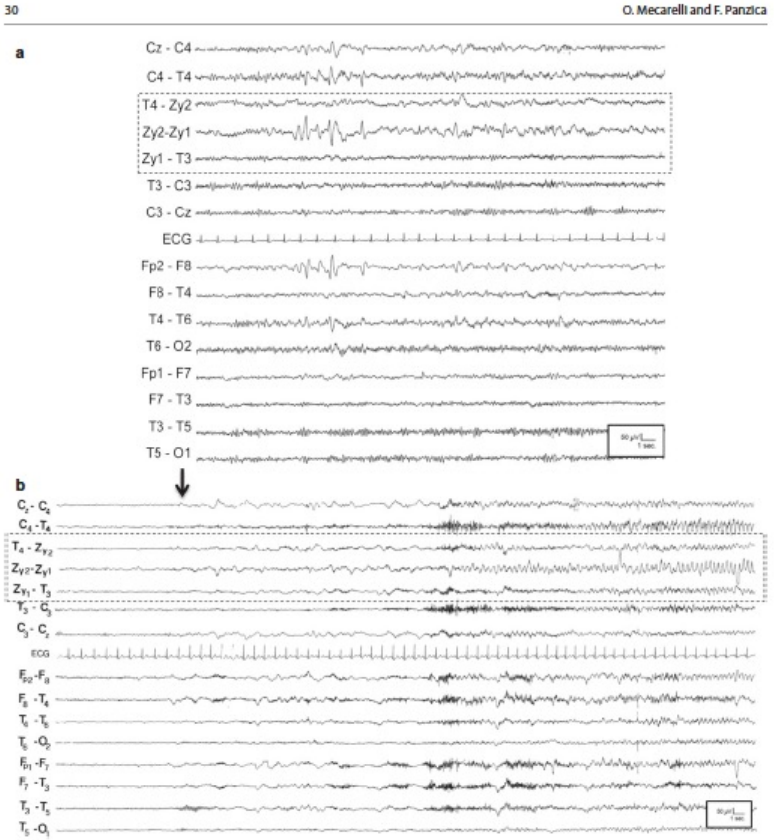

Fig. 3.6 An example of EEG recording with additional zygomatic electrodes in a 35-year-old woman with temporal epilepsy: interictal (a) and ictal (b, onset of discharge at arrow) epileptic pattern (courtesy of Francesca Bisulli and Paolo Tinuper, IRCCS Institute of Neurological Sciences, and Department of Biomedical and Neuromotor Sciences, University of Bologna, Italy)

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

Guidelines

Clinical Neurophysiology 128 (2017) 2070–2077

The standardized EEG electrode array of the IFCN

Margitta Seeck [a,*], Laurent Koessler [b], Thomas Bast [c], Frans Leijten [d], Christoph Michel [e], Christoph Baumgartner [g], Bin He [f], Sándor Beniczky [h]

Modern EEG systems are equipped with cameras allowing simultaneous video recordings. The task force strongly recommends the use of video recordings for all EEG recordings, even for short standard EEGs and for seizure monitoring, including in intensive care units. Only with careful video-analysis of events of doubtful origin, a cerebral cause can be differentiated from an extracerebral cause, be it cardiac, psychogenic or other. The correspondence between the semiology and EEG gives valuable information for the characterization of the recorded episodes (e.g. seizure classification).

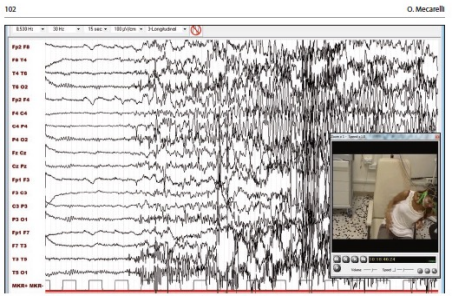

Fig. 7.10 A video-EEG recording of psychogenic non-epileptic seizure induced by a suggestion provoking technique

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NORMAL EEG *(intra- and interindividual variability, effect of age, etc)*

Awake EEG

- Physiological Rhythms & Graphoelements – Background rhythms (alpha, mu, breach rhythm, lambda waves)

Sleep EEG

- EEG changes during stages (N1-N2-N3, R) and physiological graphoelements (Vertex waves, POSTs, K complex, Spindles)

Normal Variants and Unusual EEG patterns (awake and sleep EEG)

PATHOLOGICAL EEG PATTERNS

- Changes in Background Rhythms
- Slowings
- Epileptiform Abnormalities
- Periodic and Rhythmic patterns
- Attenuation/Suppression of electrocerebral activity

Epileptiform EEG Abnormalities

- **Epileptiform pattern, or Interictal Epileptiform Discharge - IEDs, or Epileptiform Activity (synonims):**
  interictal transients distinguishable from the background activity,
  with – but not exclusively – spiky morphology
  (abundant: ≥ 1/10 s; frequent: < 1/10s - ≥ 1/min; occasional: < 1 min ≥ 1/h; rare: < 1/h)

(Hirsch et al, J Clin Neurophysiol 38, 1, 2021)

- **Seizure EEG pattern or Ictal activity (different type):**
  - repetitive epileptiform discharges, lasting several seconds (usually > 10 s), at > 2 Hz and/or characteristic pattern with quasi-rhythmic spatio-temporal evolution, etc
  - electrodecremental period (usually with superimposed fast activity, < 10 s)
  - fast paroxysmal activity (< 10 s)

Electroclinical seizure

Electrographic or subclinical seizure

N. Kane et al. / Clinical Neurophysiology Practice 2 (2017) 170–185

A revised glossary of terms most commonly used by clinical electroencephalographers and updated proposal for the report format of the EEG findings. Revision 2017

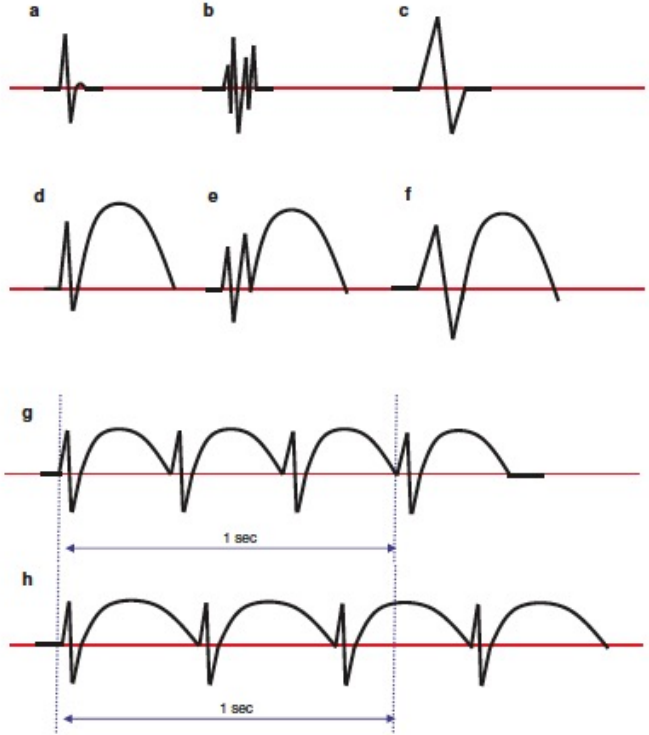


Fig. 13.2 Graphic representation of epileptiform abnormalities: (**a**) spike, (**b**) polyspikes (**c**) sharp wave, (**d**) Spike-and-Slow-Wave complex (SSWc), (**e**) polyspikes-and-slow-wave complex, (**f**) sharp-and-slow-wave complex, (**g**) typical SSWc (3 Hz), (**h**) atypical slow SSWc (<3 Hz)

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

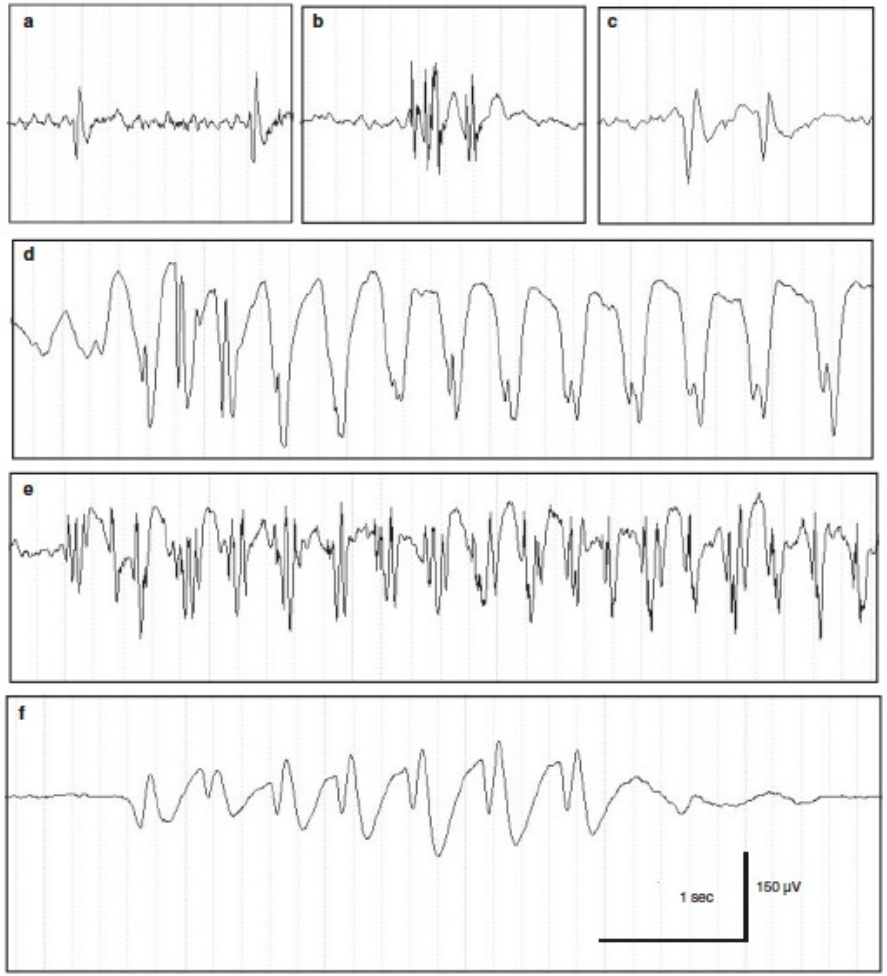
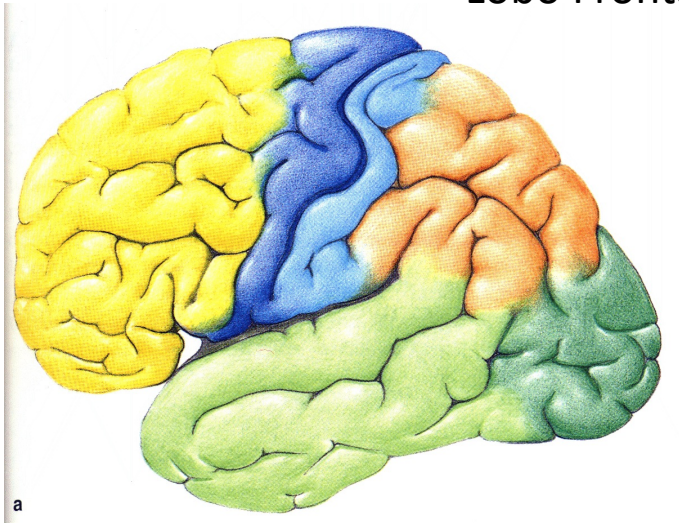
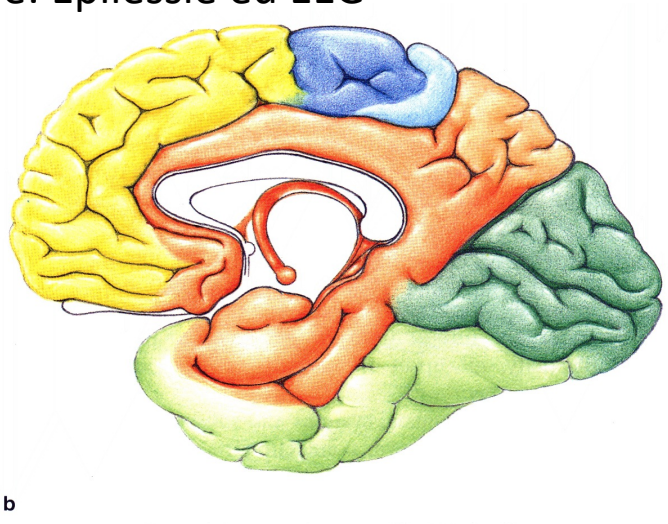
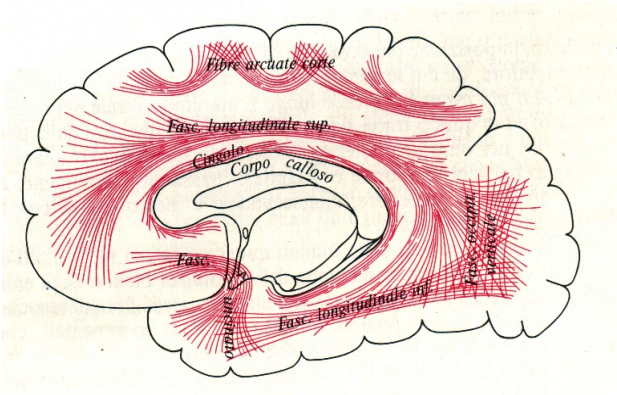


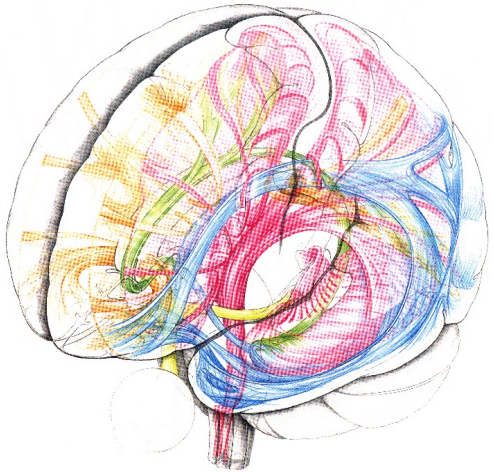
Fig. 13.3 Raw EEG examples of epileptiform abnormalities (**a**, **b**, **c**, **d**, **e**, **f** in Fig. 13.2)

Lobo Frontale: Epilessie ed EEG









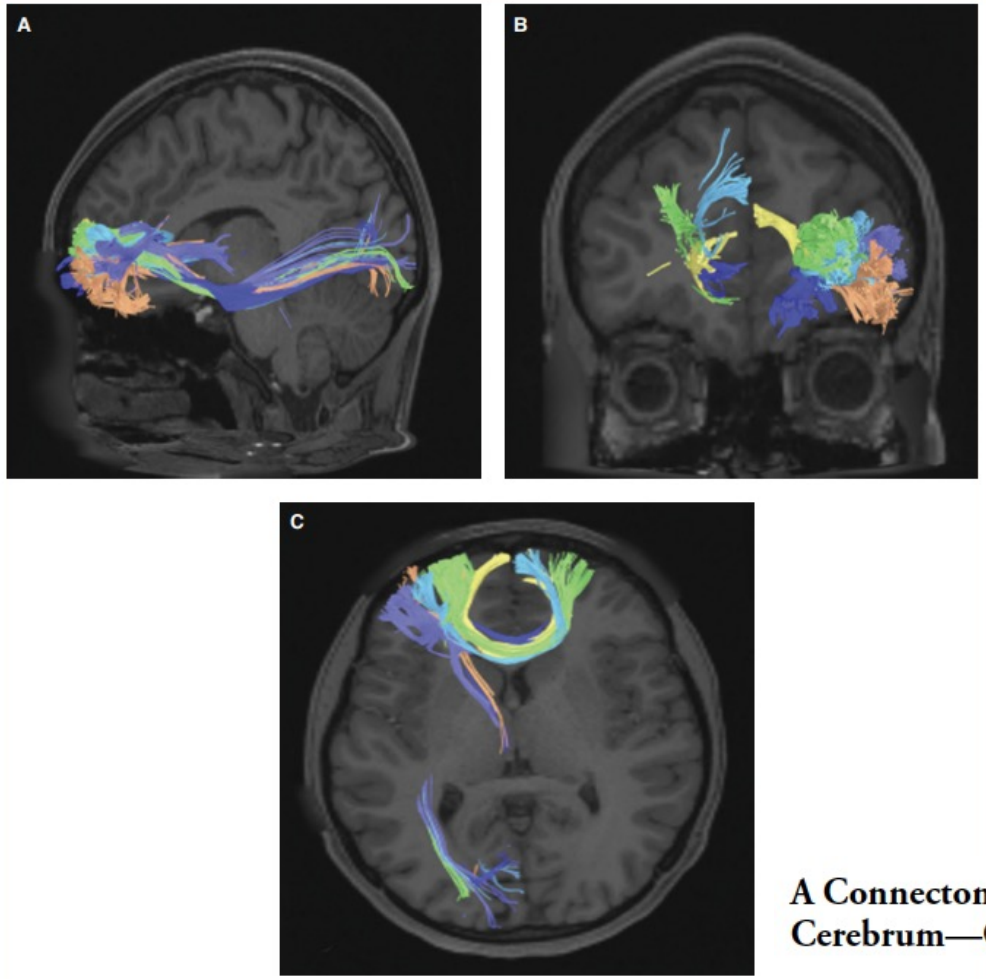


FIGURE 2. *Combined structural connectivity of frontal polar parcellations.* **A**, *Sagittal,* **B**, *coronal, and* **C**, *axial views. Tracks include 10pp (dark blue), 10d (light blue), a10p (pink), p10p (yellow), a47r (gray), and p47r (light pink).*

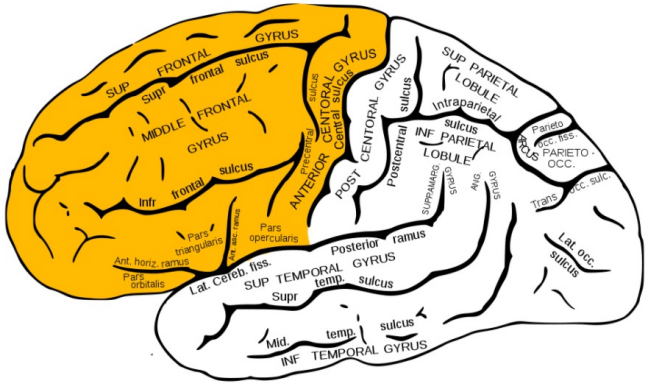
A Connectomic Atlas of the Human Cerebrum—Chapter 2: The Lateral Frontal Lobe

Operative Neurosurgery 15:S10–S74, 2018

FRONTAL LOBE SEIZURE

ILAE International League Against Epilepsy

EpilepsyDiagnosis.org
Diagnostic Manual



Overview

The frontal lobe is the largest lobe and gives rise to seizures with distinctive features depending on the area of the frontal lobe involved. Motor features are prominent and motor seizure types seen range from focal hyperkinetic seizures with pelvic thrusting and bipedal kicking or pedalling to focal bilateral motor seizures with asymmetric tonic posturing. Frontal lobe seizures may begin with a brief aura, even when seizures occur from sleep. Seizures are typically brief, and can have prominent vocalization, bizarre behavior, urinary incontinence, and head and eye deviation. Frontal lobe seizures may be exclusively nocturnal and often cluster. The ictal EEG may not show ictal patterns or may be obscured by movement artifact.

CAUTION When awareness is impaired, frontal focal impaired awareness seizures can be difficult to distinguish from absence seizures.

CAUTION Nocturnal frontal lobe seizures can be mistaken for parasomnias, however:

- Frontal lobe seizures are usually brief events (< 2 minutes), with stereotyped features seen from seizure to seizure and preserved awareness. Parasomnias are usually longer in duration (> 10 minutes), have variable features from event to event and are characterized by a confusional state with the patient having no memory of the event afterwards.
- In parasomnias, clustering is rare and the common non-REM parasomnias typically occur 1-2 hours after falling asleep, in the first cycle of deep slow wave sleep. Nocturnal frontal lobe seizures typically occur throughout the night, and more frequently within half an hour of falling asleep or awakening.

CAUTION Frontal lobe seizures may be mis-diagnosed as non-epileptic seizures as there may be bilateral motor phenomena with preserved awareness, and the ictal EEG can be normal.

Subtypes of frontal lobe seizures

1. **Primary sensorimotor cortex**

   Seizures are focal motor seizures characterized by localized clonic, tonic-clonic, tonic or myoclonic activity. They may exhibit features of a Jacksonian march where unilateral tonic-clonic movements start in one muscle group and spread systematically to adjacent groups reflecting the spread of ictal activity through the motor cortex according to the homunculus. There may be focal somatosensory features alone, such as unilateral tingling, or in combination with motor features. Negative motor features such as focal atonic features may also occur.

2. **Supplementary sensorimotor cortex**

   Seizures are focal bilateral motor seizures characterized by an abrupt onset and offset of asymmetric tonic posturing, lasting 10-40 seconds with minimal postictal confusion. Asymmetric posturing of the upper limbs occurs, with extension of the upper limb contralateral to the hemisphere of seizure onset and flexion of the ipsilateral upper limb. Loud vocalization or speech arrest can occur at seizure onset. The head and eyes are often turned to the side contralateral to the hemisphere of seizure onset. There may be a focal somatosensory seizure prior to onset of the motor features.

   CAUTION The supplementary sensorimotor area is highly connected to other brain regions and asymmetric posturing may be seen in seizures from other regions through rapid spread to the supplementary sensorimotor area.

3. **Orbitofrontal cortex**
   Impaired awareness, initial repetitive automatisms, olfactory hallucinations and illusions and autonomic features may be seen.

4. **Frontopolar cortex**
   Seizures may be characterized by forced thoughts, impaired awareness, ipsilateral head and eye version with possible progression to contralateral version, autonomic features and axial tonic-clonic movements resulting in falls.

5. **Dorsolateral frontal cortex**
   In the dominant hemisphere, a seizure occurring in or near Broca's area can result in aphasia or dysphasia in a patient who is otherwise awake and responsive. Motor features occur, most commonly tonic features, and are accompanied by contralateral head and eye version. Forced thoughts may be described.

6. **Cingulate cortex**
   Seizures are characterized by automatisms at onset with impaired awareness, emotion/mood and autonomic features. Focal emotional seizures with laughter (gelastic seizures) may occur.

7. **Fronto-parietal operculum**
   Seizures are characterized by facial (mouth and tongue) clonic movements (which may be unilateral), laryngeal symptoms, articulation difficulty, swallowing or chewing movements and hyper-salivation. Autonomic (e.g. epigastric, urogenital, gastrointestinal, cardiovascular or respiratory) and emotional (e.g. fear) features are common. Gustatory hallucinations are particularly common.

   NOTE the terms fronto-parietal opercular, centrotemporal, sylvian and rolandic seizures are synonymous, referring to seizures involving the region around the central sulcus, particularly in the lower central sulcus.

ILAE 2017 Classification of Seizure Types Expanded Version[1]

Focal Onset

Aware	Impaired Awareness

Motor Onset
- automatisms
- atonic[2]
- clonic
- epileptic spasms[2]
- hyperkinetic
- myoclonic
- tonic

Non-Motor Onset
- autonomic
- behavior arrest
- cognitive
- emotional
- sensory

focal to bilateral tonic-clonic

Generalized Onset

Motor
- tonic-clonic
- clonic
- tonic
- myoclonic
- myoclonic-tonic-clonic
- myoclonic-atonic
- atonic
- epileptic spasms[2]

Non-Motor (absence)
- typical
- atypical
- myoclonic
- eyelid myoclonia

Unknown Onset

Motor
- tonic-clonic
- epileptic spasms

Non-Motor
- behavior arrest

Unclassified[3]

1 Definitions, other seizure types and descriptors are listed in the accompanying paper and glossary of terms.

2 These could be focal or generalized, with or without alteration of awareness

3 Due to inadequate information or inability to place in other categories

From *Fisher et al. Instruction manual for the ILAE 2017 operational classification of seizure types. Epilepsia doi: 10.1111/epi.13671*

FRONTAL LOBE SEIZURE

International League Against Epilepsy

INTERNATIONAL LEAGUE AGAINST EPILEPSY Established 1909
EpilepsyDiagnosis.org
Diagnostic Manual

Clinical Overview | Videos | EEG | Differential diagnoses | Related Syndromes

- Autosomal dominant nocturnal frontal lobe epilepsy
- Childhood epilepsy with centrotemporal spikes
- Familial focal epilepsy with variable foci

Proposed position papers on syndrome definitions

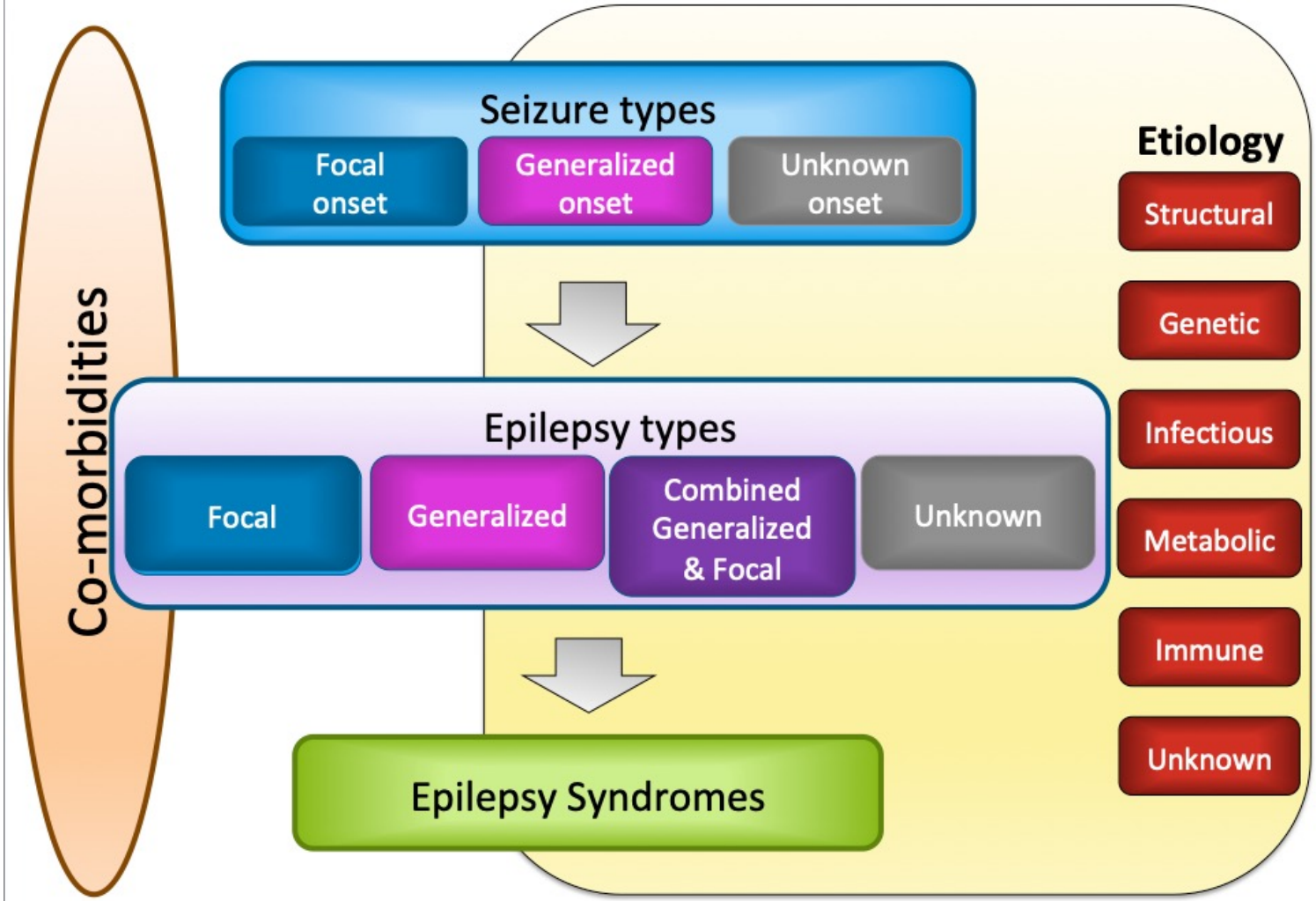
International League Against Epilepsy

Syndrome Definitions Sub-Task Force

Paolo Tinuper
Co-Chair

Elaine Wirrell
Co-Chair

Sindromi epilettiche con esordio durante l'infanzia[23]	Epilessie focali ad auto-risoluzione: • Epilessia ad Auto-Risoluzione con Punte CentroTemporali • Epilessia ad Auto-Risoluzione con Crisi Autonomiche • Epilessia Occipitale Visiva dell'Infanzia
Sindromi epilettiche con esordio in età Adolescenziale, Adulta e in età variabile[24]	• Epilessia del Lobo Temporale Mesiale associata a Sclerosi dell'Ippocampo • Epilessia Ipermotoria Correlata al Sonno • Epilessia Familiare Focale a Foci Variabili • Epilessia con Caratteristiche Uditive


Seizure types
Focal onset
Generalized onset
Unknown onset
Etiology
Structural
Genetic
Infectious
Metabolic
Immune
Unknown
Co-morbidities
Epilepsy types
Focal
Generalized
Combined Generalized & Focal
Unknown
Epilepsy Syndromes

■ Seminar in epileptology
Epileptic Disord 2021; 23 (3): 437-458
Epileptic Disorders

Electroclinical markers to differentiate between focal and generalized epilepsies

Sharika Raga[1,2], Sylvain Rheims[3,4,5], Nicola Specchio[5,6], Jo M. Wilmshurst[1,2]

▼ **Table 1.** Differentiating features for focal versus generalized epilepsies.

	Focal epilepsies	Generalized epilepsies
Classification	Localized brain networks	Rapidly engaging bilaterally distributed networks in the brain
Seizure	Focal activity	Generalized involvement. Motor or non-motor
History	May have retained awareness; usually aware of onset of event even if loss of awareness later	Awareness typically lost and no or minimal memory of event*
Clinical	Normal; focal neurological findings should anatomically correlate with seizure semiology *e.g.* hemiplegia	Normal; bilateral or global neurological involvement *e.g.* cerebral palsy with spastic quadriplegia
EEG	Focal discharges; maybe normal. Occasional seizure propagation with bilateral synchrony	Generalized discharges; may also have interictal focal discharges
Neuroimaging	Normal; focal localized pathology	Normal; usually diffuse brain involvement
Genetics	Rare but may occur. More in neonatal and infantile age group than adults.	More common than focal seizures. More in neonatal and infantile age group than adults.
Development	Less commonly affected	Aetiology- and epilepsy syndrome-driven. Most people with idiopathic or genetic generalized epilepsies have normal development, whilst infants with early-onset epileptic encephalopathies are severely affected.

*Myoclonic seizures may have retained awareness.

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CORSO VIDEO EEG LICE 3° EDIZIONE CATANIA, 24-27 OTTOBRE 2021

Seminar in epileptology

Epileptic Disord 2021; 23 (3): 437-458

Epileptic Disorders

Electroclinical markers to differentiate between focal and generalized epilepsies

Sharika Raga[1,2], Sylvain Rheims[3,4,5], Nicola Specchio[5,6], Jo M. Wilmshurst[1,2]

Delineation between generalized and focal epilepsies is important for ongoing management. EEG, neuroimaging and other investigations (genetics, immune markers, etc.) can support the outcome but distinction between focal and generalized epilepsy in isolation is rarely achieved using such techniques.
Certain clinical settings such as age, underlying aetiologies, and co-morbidities may be more predisposed to specific types of epilepsy.

***The differentiation between generalized and focal seizures remains a clinical process based on meticulous clinical history and examination**, and is of relevance for the selection of antiseizure medications and identification of patients who may be viable for epilepsy surgery.*

FRONTAL LOBE SEIZURE

Clinical Overview | Videos | EEG | Differential diagnoses | Related Syndromes

Background/Interictal/Activation

Please refer to specific syndromes and etiologies in which this seizure type occurs for specific information. As a general rule, EEG abnormality may be enhanced in sleep deprivation states and in sleep.

There are large areas of mesial and inferior frontal cortex that are not sampled by scalp EEG. The interictal EEG is frequently normal if the etiology of the epilepsy is a structural brain abnormality in these areas. Even with repeated EEGs, epileptiform discharges may only be seen in up to 70% of such patients. In these patients, discharges are typically midline or bi-frontal.

Secondary bilateral synchronism: (> focus in antero-mesial regions):
focal activity followed by bilateral, synchronous, relatively symmetrical paroxysmal activity (interictal and/or ictal)

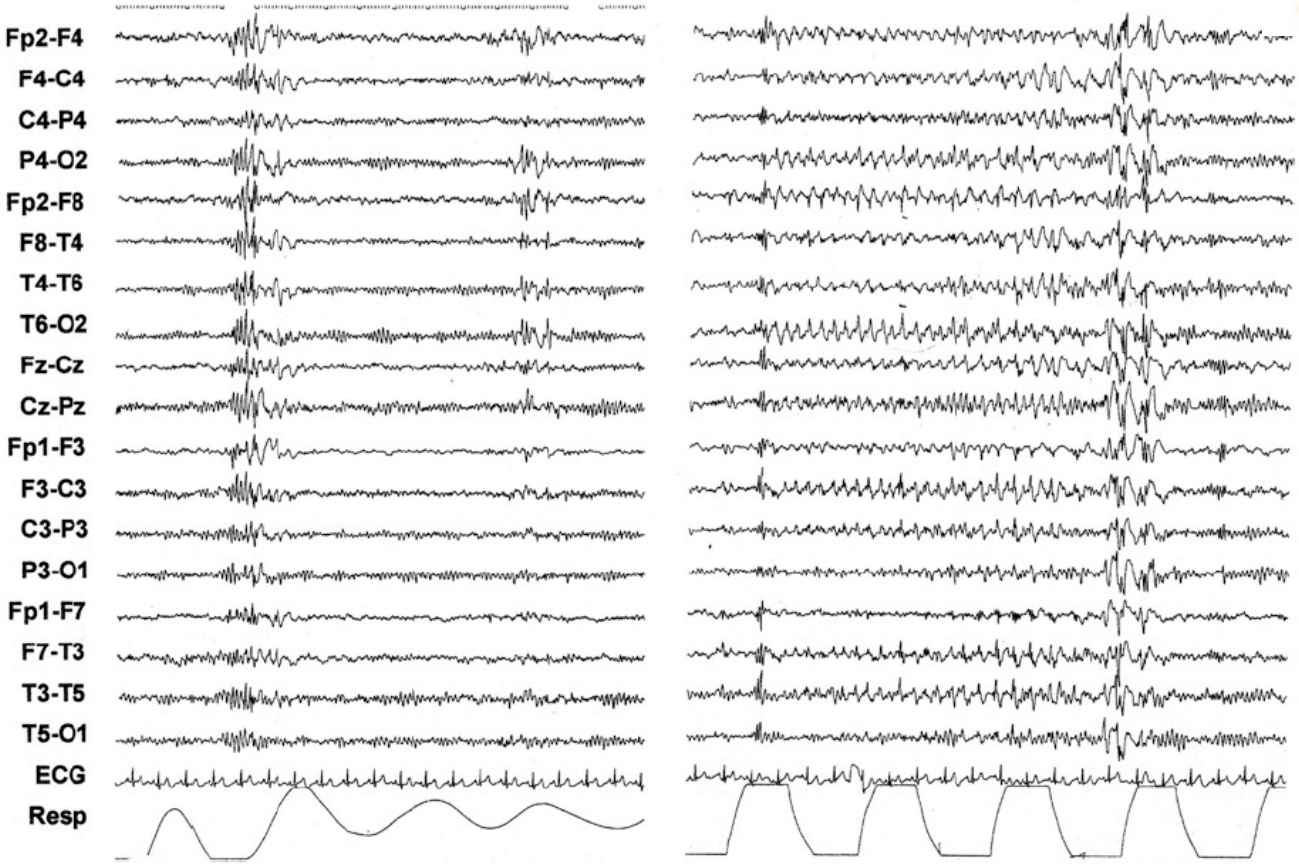


Fig. 26.8 Secondary bilateral synchronism in patients with cryptogenic drug-resistant focal epilepsy with right frontal lobe seizures. The interictal discharge shows a very brief lead in the right frontal channel, then a rapid bilateral spread follows, and a rhythmic spike-wave activity predominant anteriorly and on the right follows (right panel)

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

Ictal

Ictal EEG in frontal lobe seizures may be difficult to interpret. Seizures often involve hyperkinetic activity, which causes the EEG to be obscured by muscle artifact. Ictal EEG can demonstrate a localized ictal rhythm in lateral frontal lobe seizures with localized repetitive discharges. Ictal EEG in mesial frontal lobe seizures can often appear as a generalized EEG change, if an EEG change is present. These bilateral discharges often have an amplitude asymmetry, representing secondary bilateral synchrony rather than true generalized seizure onset, and may be preceded by generalized suppression of the EEG. Ictal EEG may also be characterized by diffuse or localized low voltage fast rhythms.

CAUTION False localization may occur, especially to the ipsilateral temporal lobe. Interpretation of seizure features in conjunction with ictal EEG is important in this situation.

- Massive artifacts
- Ictal pattern in FLE is nonlocalizing in > 50%

(bilateral attenuation, bilateral theta-delta activity, generalized epileptiform activity)

- Difficulty of recording ictal activity from mesial and basal cortical areas

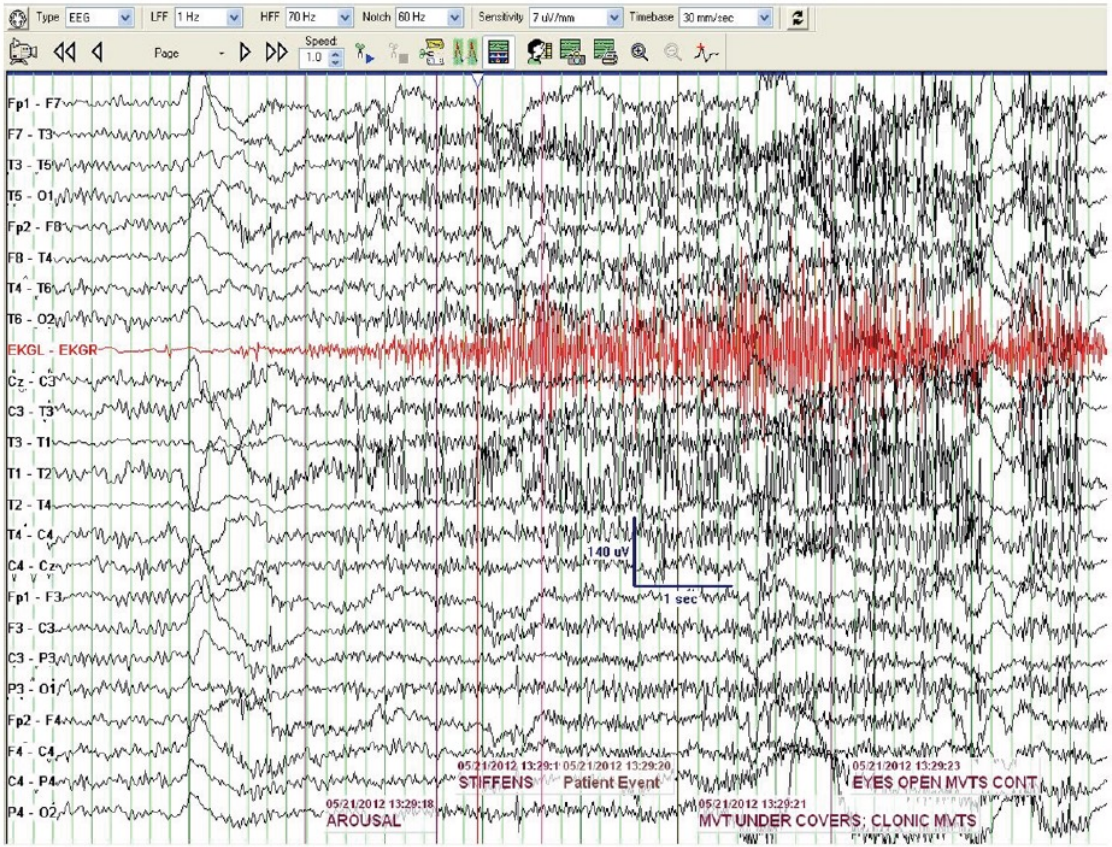
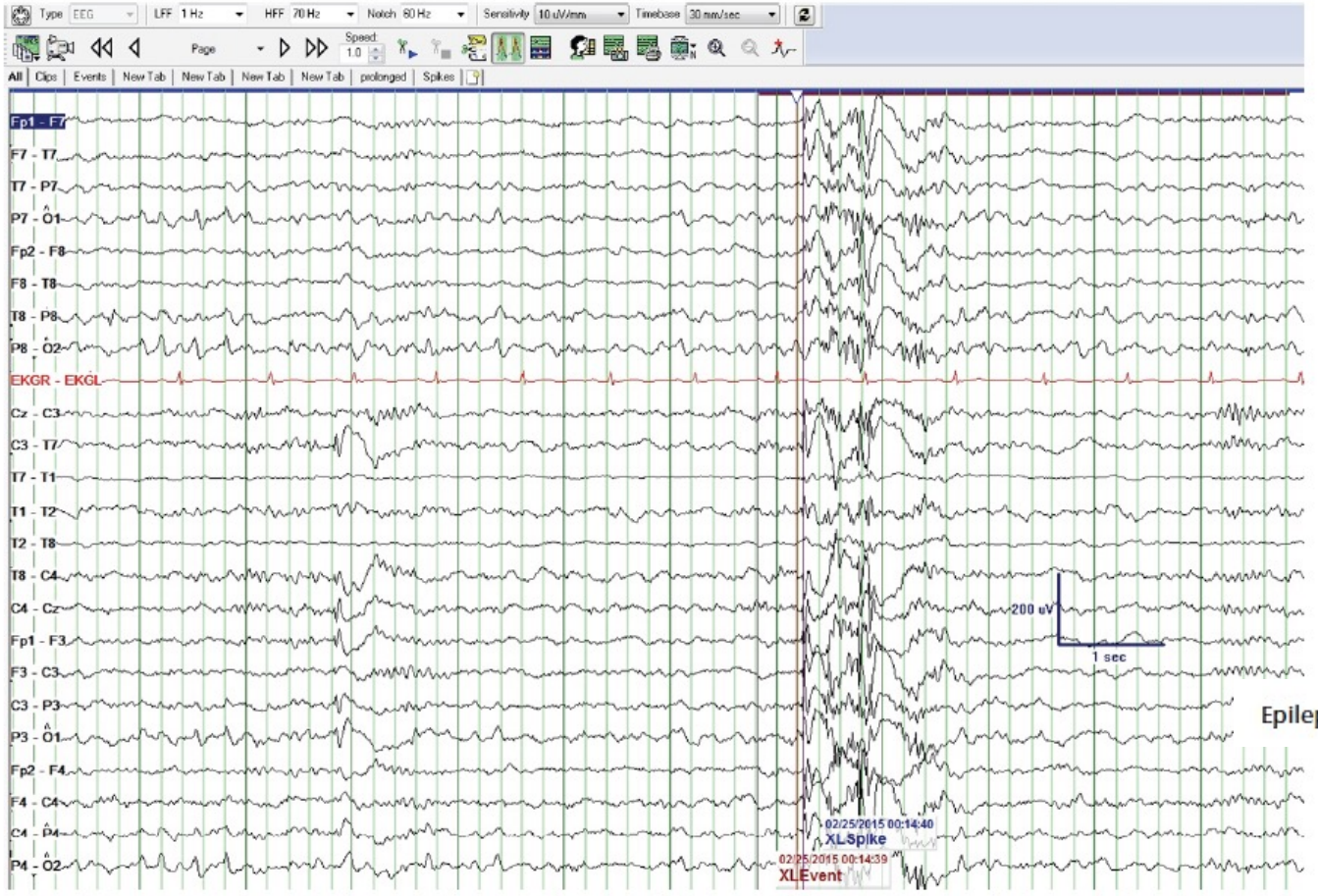


Figure 5.18. A 7-second right frontal lobe seizure in a 28-year-old female with left hemiparetic cerebral palsy, manifesting as brief nocturnal left-sided tonic posturing. Note the superimposed myogenic artefact preventing localization.

M. Koutroumanidis, *et al.* Epileptic Disord, Vol. 19, No. 3, September 2017



M. Koutroumanidis, *et al.*

Epileptic Disord, Vol. 19, No. 3, September 2017

Figure 5.17. Left frontal spike (third second) coupled with sleep elements prior to a generalized discharge composed of mixed spikes and polyspike-and-slow waves in a patient with mesial frontal lobe epilepsy.

Sleep-related Hypermotor Epilepsy (SHE)

Sleep-related Hypermotor Epilepsy - SHE

VIEWS & REVIEWS

Definition and diagnostic criteria of sleep-related hypermotor epilepsy

Tinuper et al

Neurology 86 May 10, 2016

DIAGNOSTIC CERTAINTY Criteria for diagnostic certainty of SHE were developed based on consensus expert opinions and studies of Class III level.[13,16,38]

- Diagnosis of SHE is primarily based on clinical history. The absence of clear interictal and ictal EEG correlates, both during wakefulness and sleep, does not exclude the diagnosis of SHE.[13]
- Certainty of diagnosis can be categorized into 3 levels: witnessed (possible) SHE, video-documented (clinical) SHE, and video-EEG-documented (confirmed) SHE.

ELECTROCLINICAL FEATURES Statements regarding the electroclinical features of seizures in SHE are based on core literature consisting of Class III level[13,16] or Class IV level[5,17,19,22,32–36] studies.

- Interictal and ictal scalp EEG features may be uninformative.[5,13,17,19]
- Prolonged video-EEG recording is the best available diagnostic test to assess the occurrence of seizures[13,16] but, if negative, does not rule out the diagnosis because seizures may not be recorded and interictal EEG abnormalities may be absent.[5,13,17,19]
- Sleep-related hypermotor seizures may arise from various frontal as well as from extrafrontal areas.[22,32–36]

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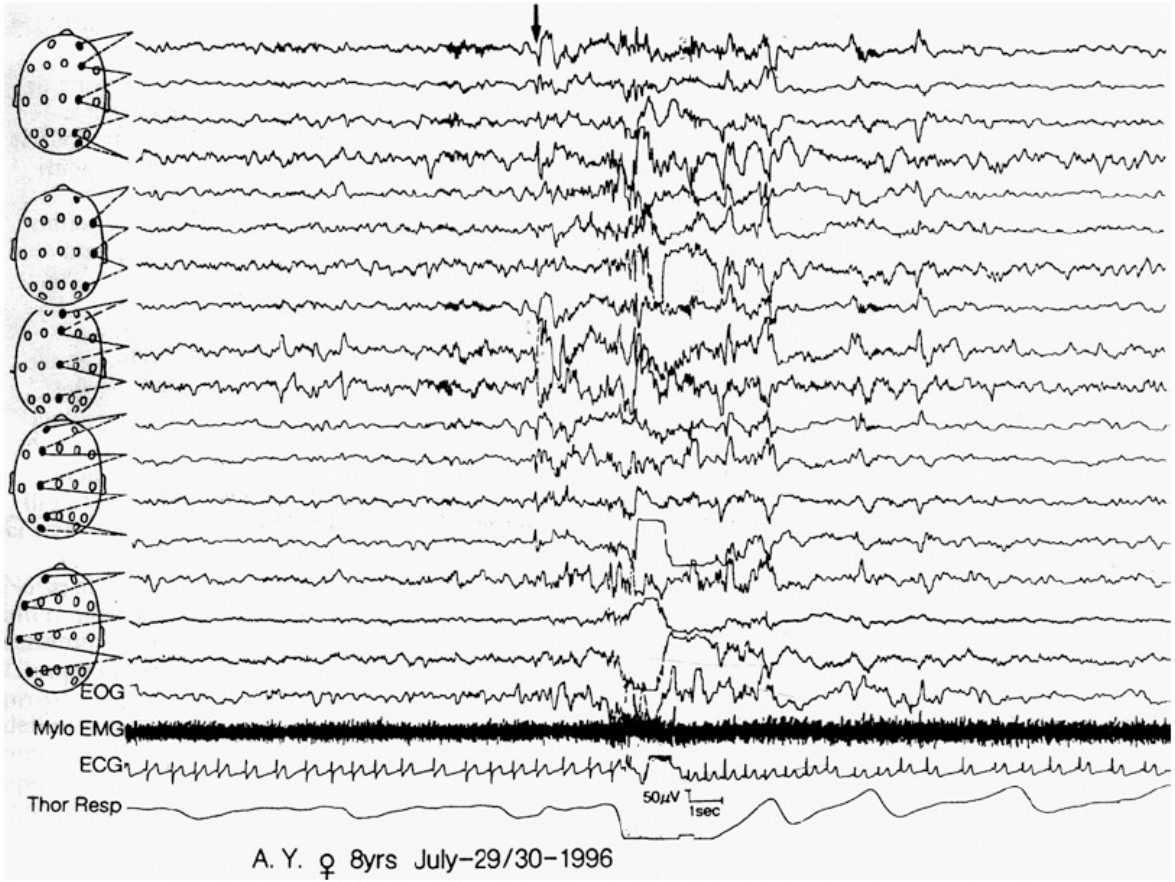


Fig. 26.6 Patient with sleep-related hypermotor epilepsy. EEG during a "paroxysmal arousal," characterized by a sudden movement of the limbs and the head, followed by recovery of sleep. Such episodes could occur several times per night. The EEG shows a high amplitude spike (arrow) in the anterior frontal leads, followed by low-amplitude fast activity

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

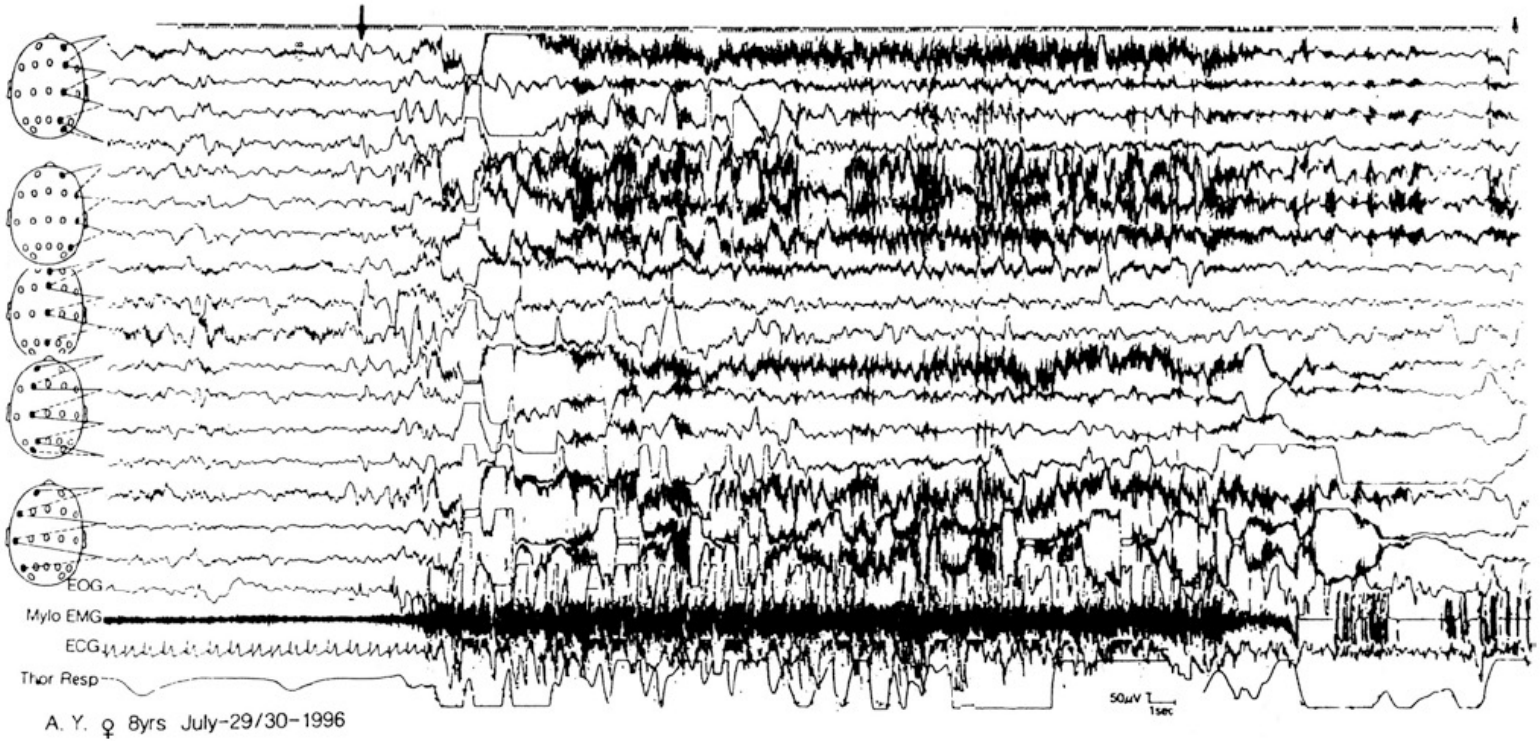


Fig. 26.7 Same patient as in Fig. 26.7 Hyperkinetic motor seizure clinically characterized by sitting al 26.6 n the bed with a frightened expression, moaning, grasping behavior toward the persons around, uncoordinated movements of the limbs, and flexion-extension of the trunk, with partially maintained consciousness; at the end of the seizure, the patient recovers immediately without postictal confusion. The EEG shows a sharp wave in the right frontal regions, followed by a low-amplitude fast activity, rapidly masked by artifacts

O. Mecarelli (ed.), *Clinical Electroencephalography*, https://doi.org/10.1007/978-3-030-04573-9_1

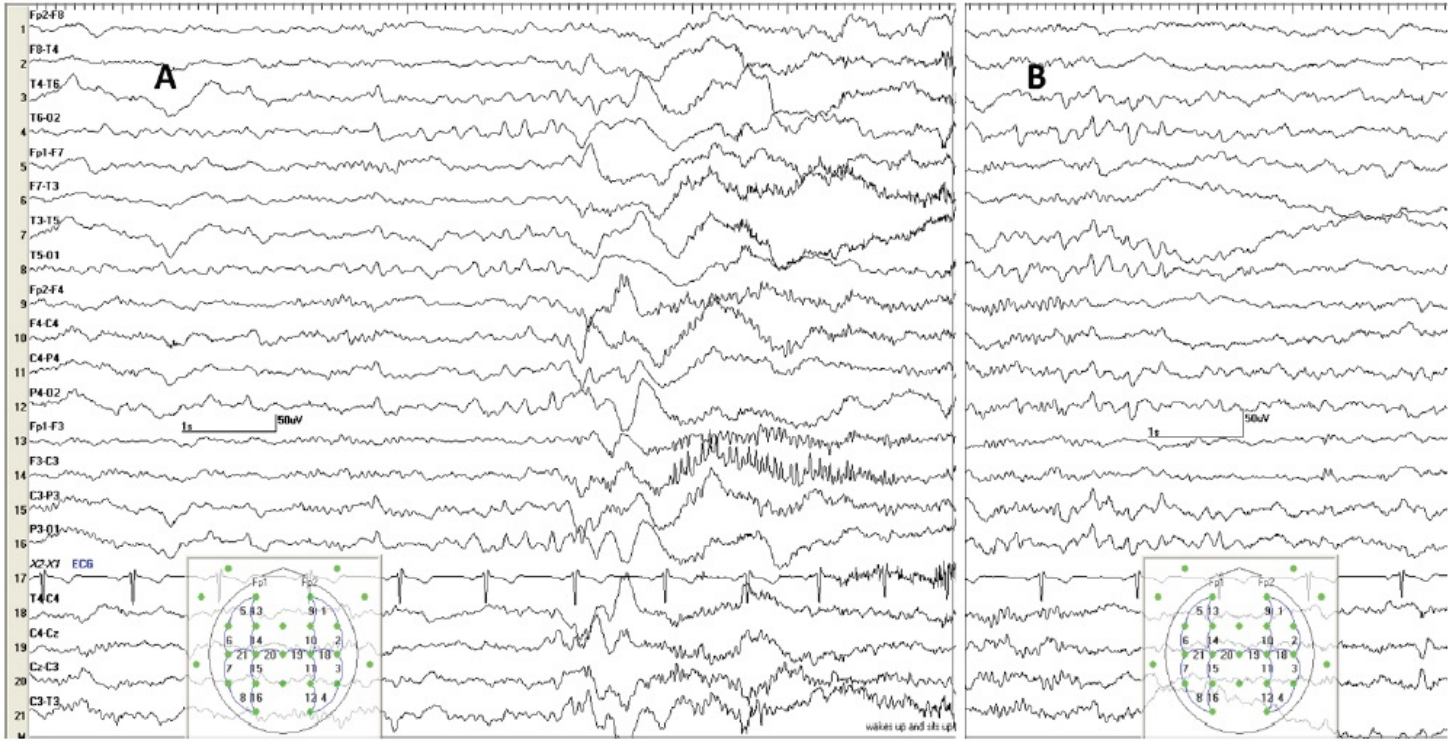


Figure 5.23. Diagnostic video telemetry of a 17-year-old woman with nocturnal "events" since her early teens. Two previous EEGs had been unremarkable. (**A**) Rhythmic spiking over the left frontal area; the patient simply wakes and sits up. (**B**) Interictal abnormalities were limited to occasional small spikes over F3. Brain MRI and PET were normal.

M. Koutroumanidis, *et al.* Epileptic Disord, Vol. 19, No. 3, September 2017

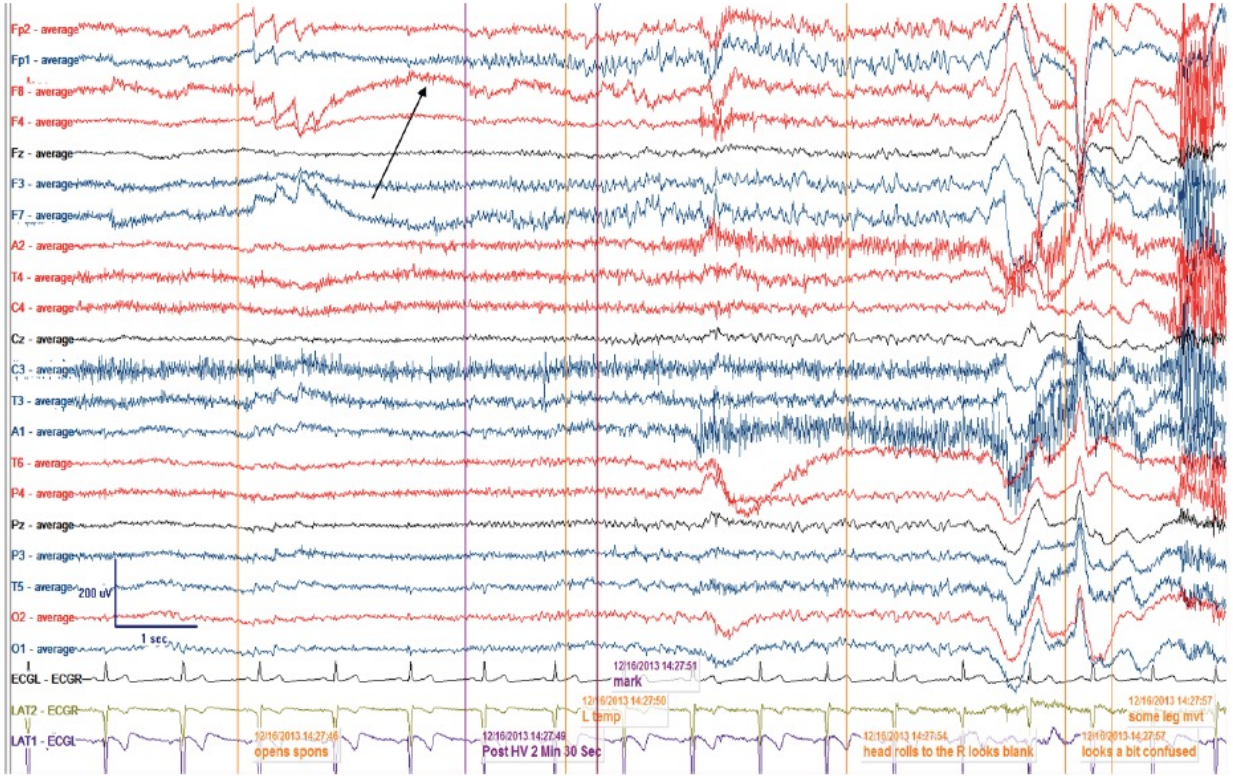


Figure 5.20. Brief left frontal electrographic seizure in a 30-year-old man with left frontal epilepsy and nocturnal seizures since childhood. MRI was normal. He remained unaware of this event. Note the initial attenuation prior to the low-voltage fast ictal discharge that progressively increases in amplitude (arrow).

M. Koutroumanidis, *et al.* Epileptic Disord, Vol. 19, No. 3, September 2017

Clinical features of sleep-related hypermotor epilepsy in relation to the seizure-onset zone: A review of 135 surgically treated cases

GIBBS ET AL. *Epilepsia.* 2019;60:707–717 (Milano/Montreal/Bologna/Genova)

Scalp EEG results (routine and video-EEG) showed a high proportion of interictal abnormalities (EEG abnormal in 111/135 patients; 82%). This percentage decreased when the localizing value of EEG based on postoperative outcome was assessed (65/135 patients; 48%), except in temporal SHE where 93% of interictal abnormalities correctly localized to the epileptogenic temporal lobe. Stereo-EEG was performed before epilepsy surgery in 81 of 135 cases (60%). The lobar location of the SOZ did not significantly influence the possibility of undergoing stereo-EEG prior to surgery.

Simultaneous subdural and scalp EEG correlates of frontal lobe epileptic sources

*Georgia Ramantani, *Matthias Dümpelmann, †Laurent Koessler, *Armin Brandt, ‡§Delphine Cosandier-Rimélé, ¶Josef Zentner, *Andreas Schulze-Bonhage, and †#**Louis Georges Maillard

Epilepsia, 55(2):278–288, 2014
doi: 10.1111/epi.12512

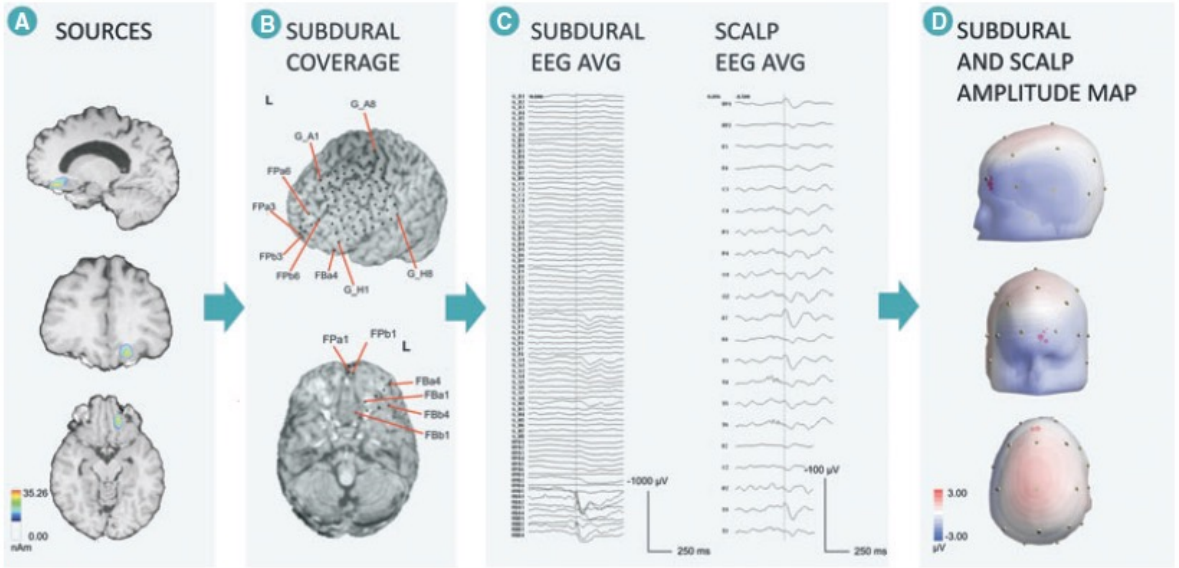
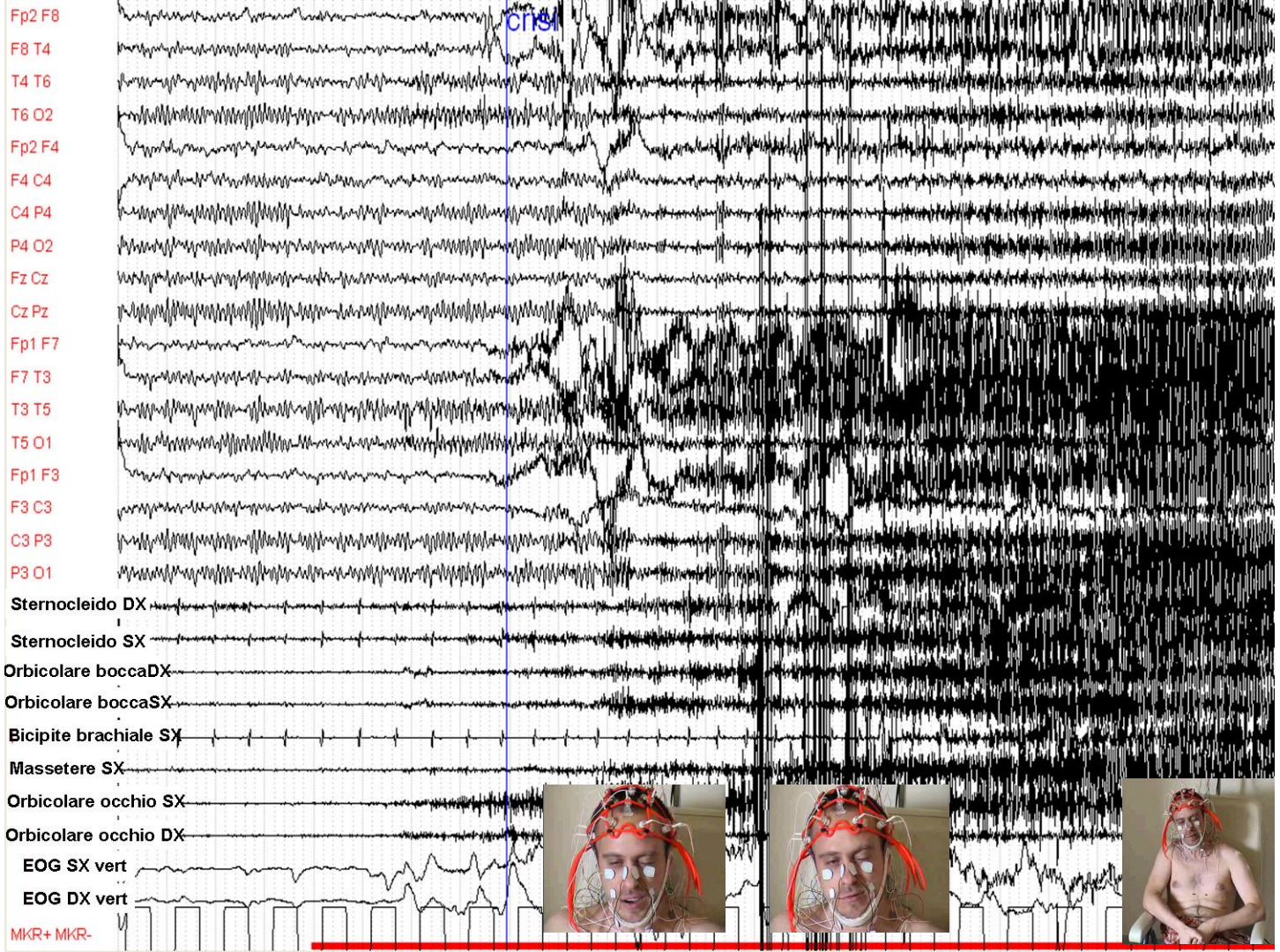
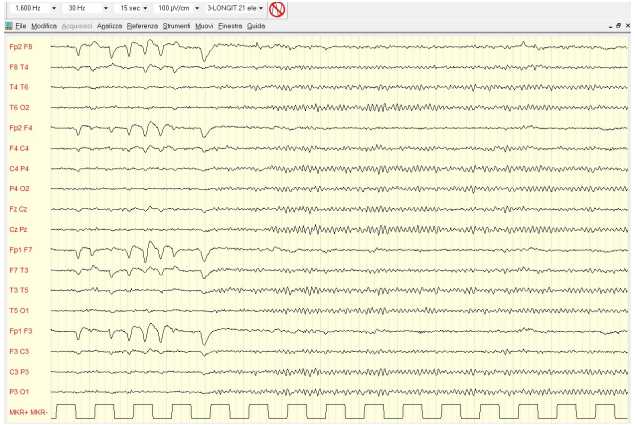


Figure 3.
Patient 12, with a mesial orbitofrontal source localized in the medial and polar part of the left orbitofrontal cortex. Illustration of the source reconstruction by MUSIC (**A**), the subdural electrode coverage (**B**), subdural EEG and scalp EEG averaged spikes (**C**), and the 3D overlay of the subdural and scalp amplitude map (**D**), with the sphere diameters corresponding to the amplitude of the subdural EEG spike. The subdural EEG average, presenting an activation of four frontobasal subdural contacts, corresponds to a bilateral left predominant frontopolar, basal and temporal scalp EEG average spike, with the highest amplitude in electrodes Fp1, F7, T3.

Epilessie Frontali su base etiologica strutturale


crisi
Fp2 F8
F8 T4
T4 T6
T6 O2
Fp2 F4
F4 C4
C4 P4
P4 O2
Fz Cz
Cz Pz
Fp1 F7
F7 T3
T3 T5
T5 O1
Fp1 F3
F3 C3
C3 P3
P3 O1
Sternocleido DX
Sternocleido SX
Orbicolare boccaDX
Orbicolare boccaSX
Bicipite brachiale SX
Massetere SX
Orbicolare occhio SX
Orbicolare occhio DX
EOG SX vert
EOG DX vert
MKR+ MKR-


1,600 Hz
30 Hz
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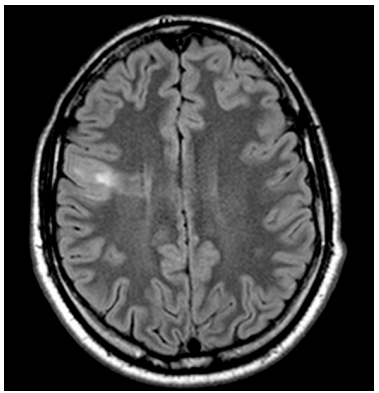
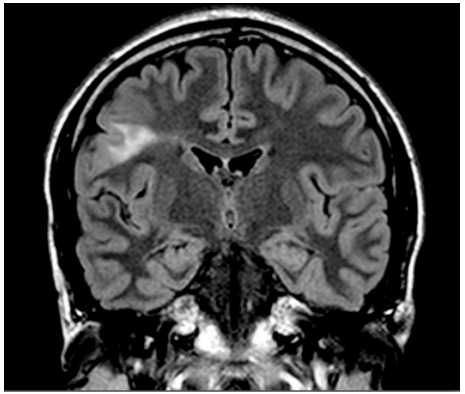
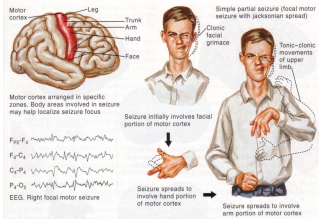
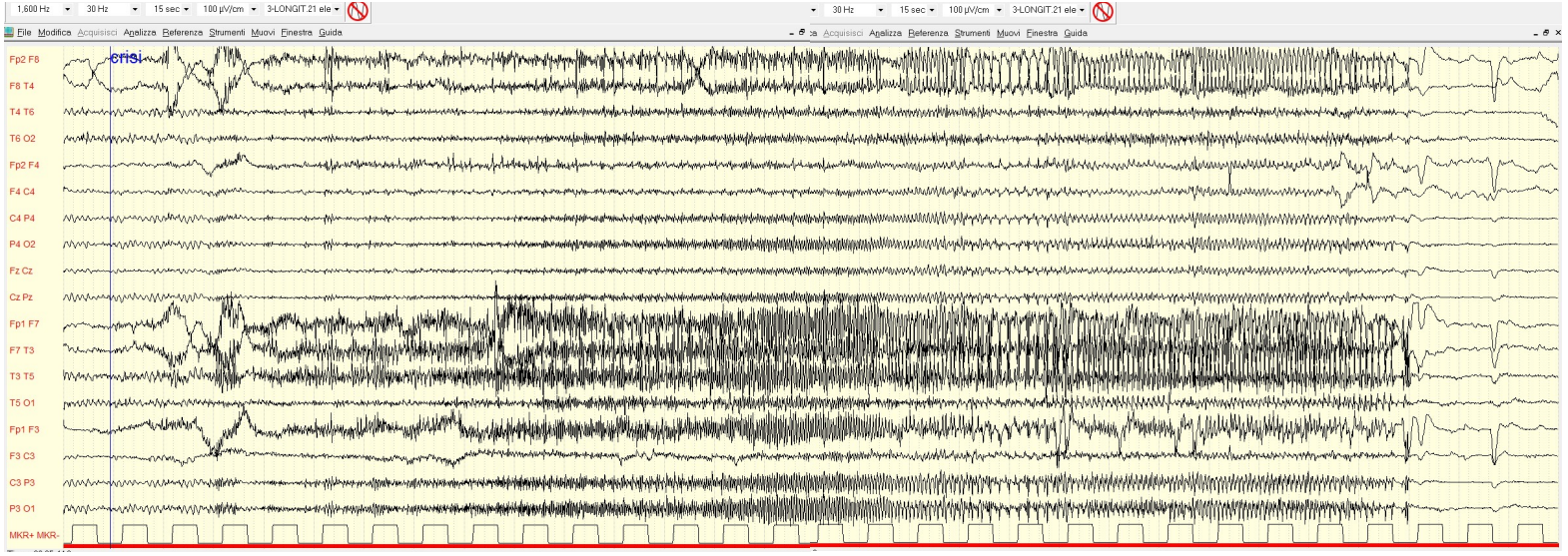
Fp2 F8
F8 T4
T4 T6
T6 O2
Fp2 F4
F4 C4
C4 P4
P4 O2
Fz Cz
Cz Pz
Fp1 F7
F7 T3
T3 T5
T5 O1
Fp1 F3
F3 C3
C3 P3
P3 O1
MKR+ MKR-






Motor cortex
Leg
Trunk
Arm
Hand
Face
Motor cortex arranged in specific zones. Body areas involved in seizure may help localize seizure focus
Simple partial seizure (focal motor seizure with jacksonian spread)
Clonic facial grimace
Tonic–clonic movements of upper limb
Seizure initially involves facial portion of motor cortex
Seizure spreads to involve hand portion of motor cortex
Seizure spreads to involve arm portion of motor cortex
EEG, Right focal motor seizure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T4 T6
T6 O2
Fp2 F4
F4 C4
C4 P4
P4 O2
Fz Cz
Cz Pz
Fp1 F7
F7 T3
T3 T5
T5 O1
Fp1 F3
F3 C3
C3 P3
P3 O1
MKR+ MKR-

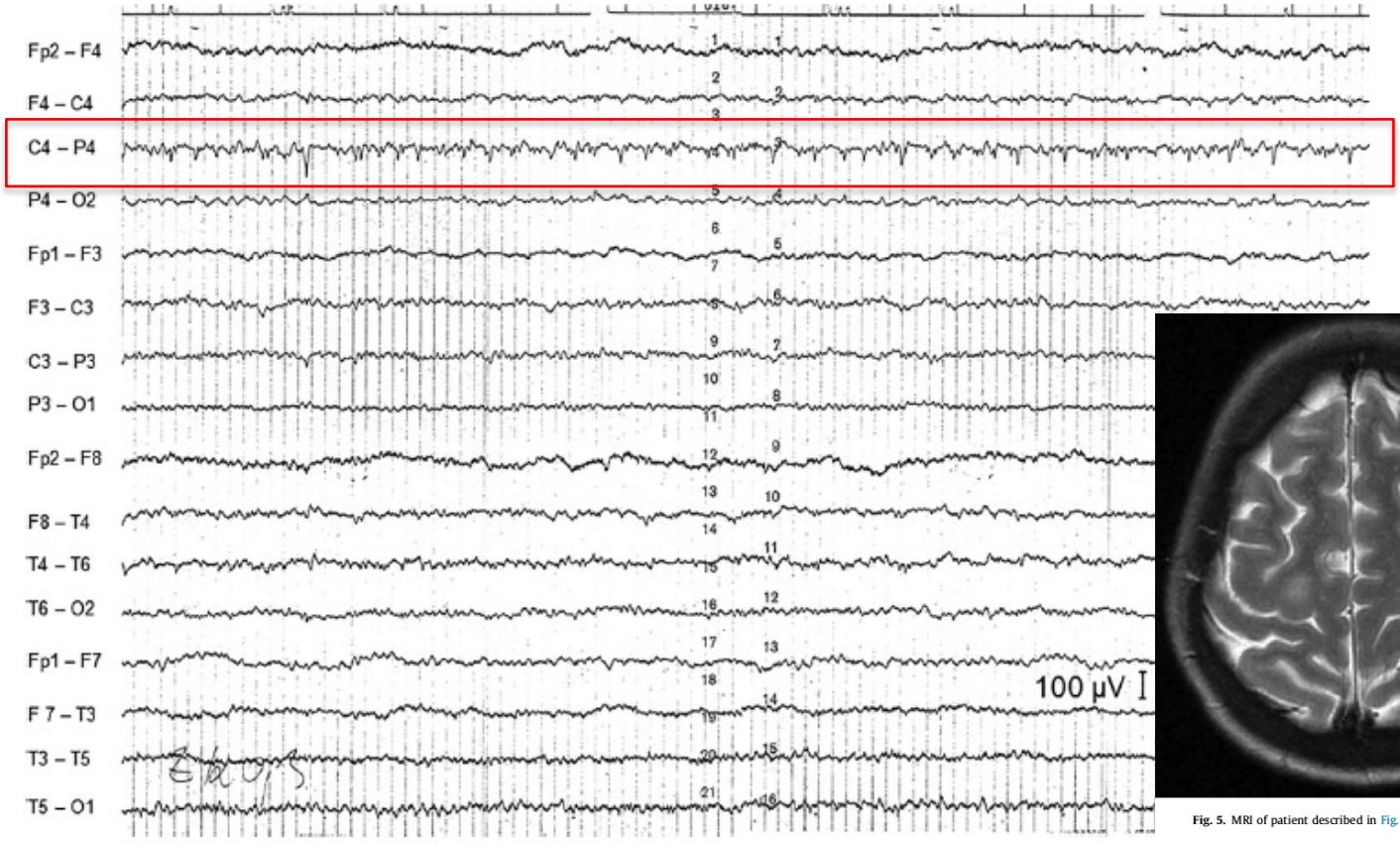


Fig. 5. MRI of patient described in Fig. 1. Right postcentral FCD.

Fig. 1. Female, 22 years, time constant (tc) 0.3, F 30. Normal neurological and cognitive condition, epilepsy with focal sensory, tonic and rare generalized seizures due to right postcentral FCD (see Fig. 5). Continuous typical right postcentral rhythmical RMS during sensible aura continua. Example for typical rhythmic RMS as ictal pattern of aura continua.

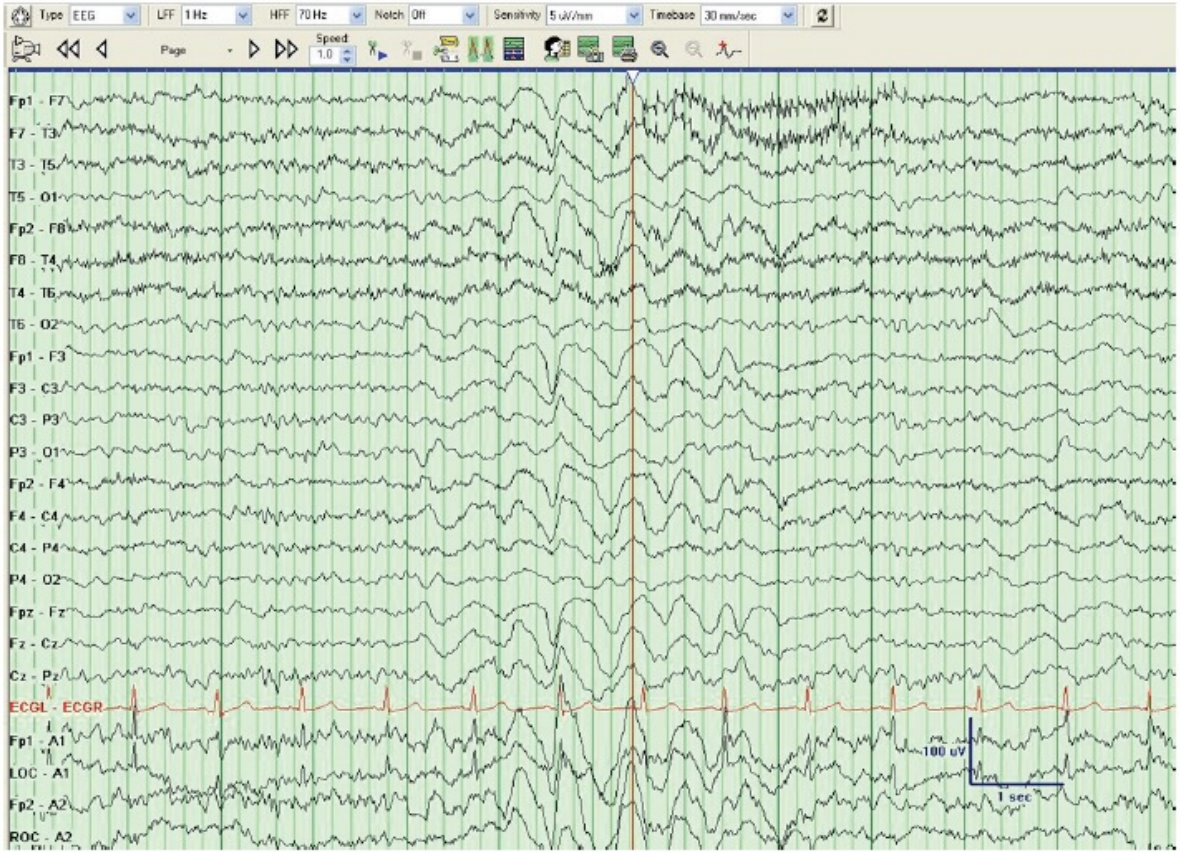
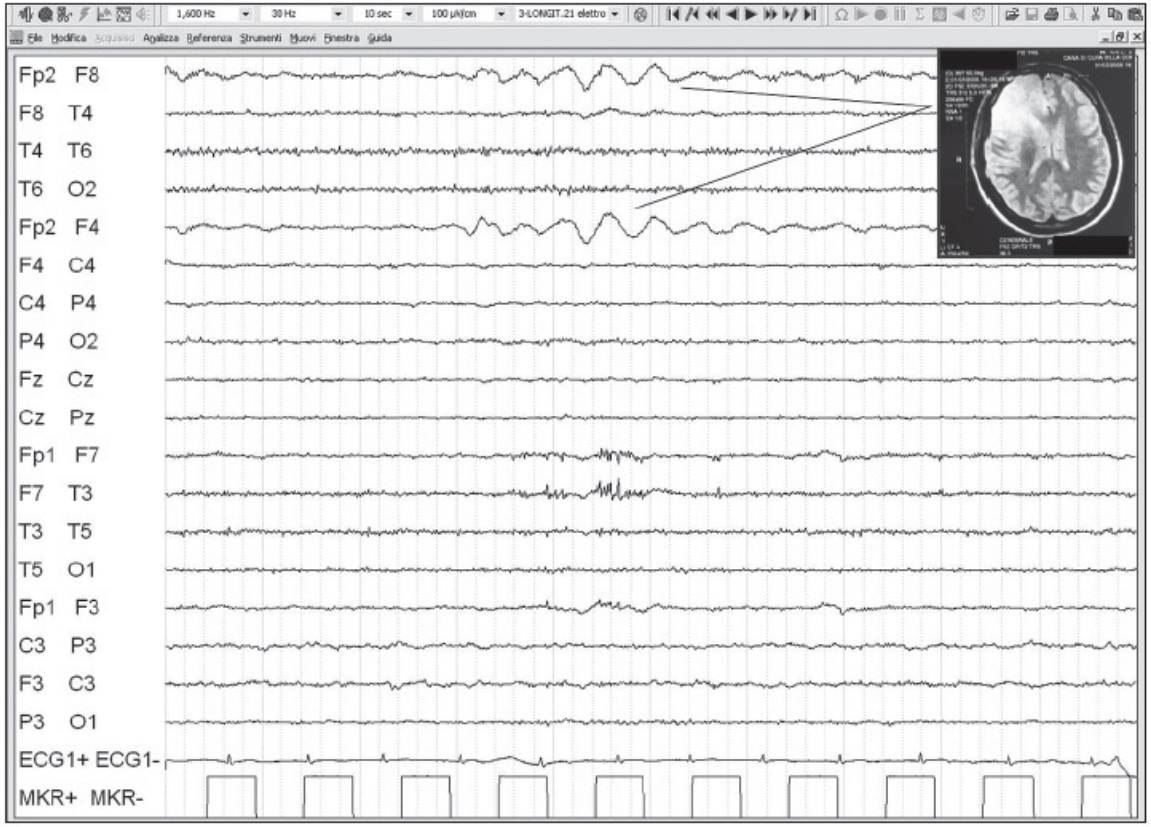


Figure 5.15. Frontal intermittent rhythmic delta activity in a patient with orbitofrontal epilepsy.

M. Koutroumanidis, *et al.*

Epileptic Disord, Vol. 19, No. 3, September 2017



34. Tumori cerebrali O. Mecarelli, P. Pulitano

Manuale Teorico Pratico di Elettroencefalografia

ISBN 978-88-7556-427-8

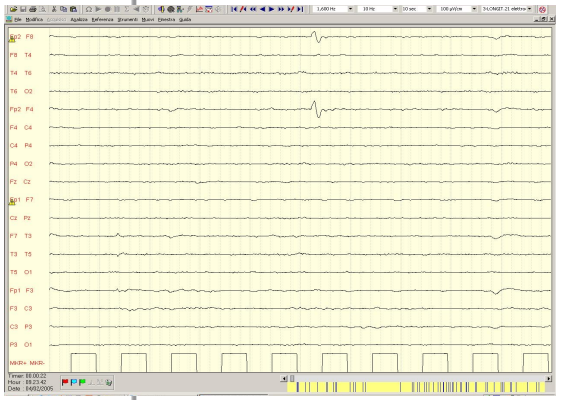
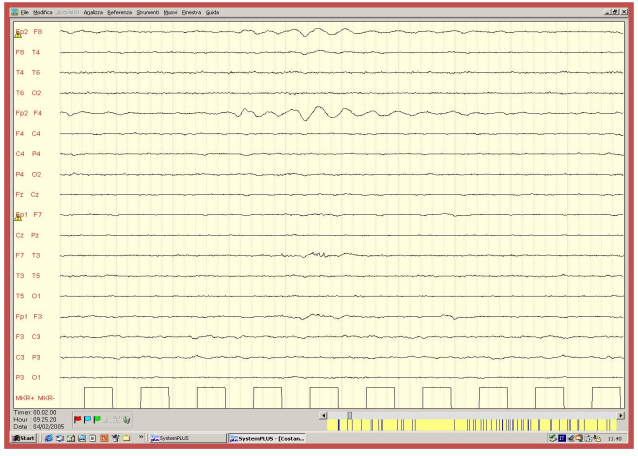
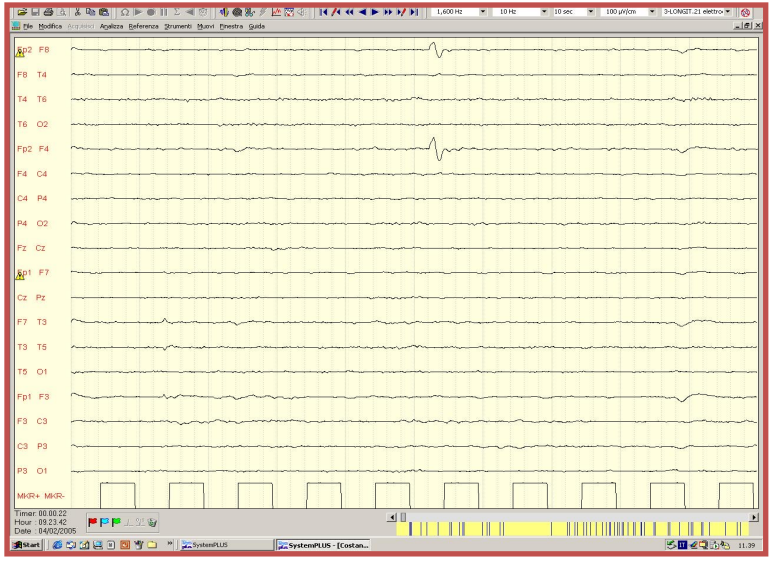
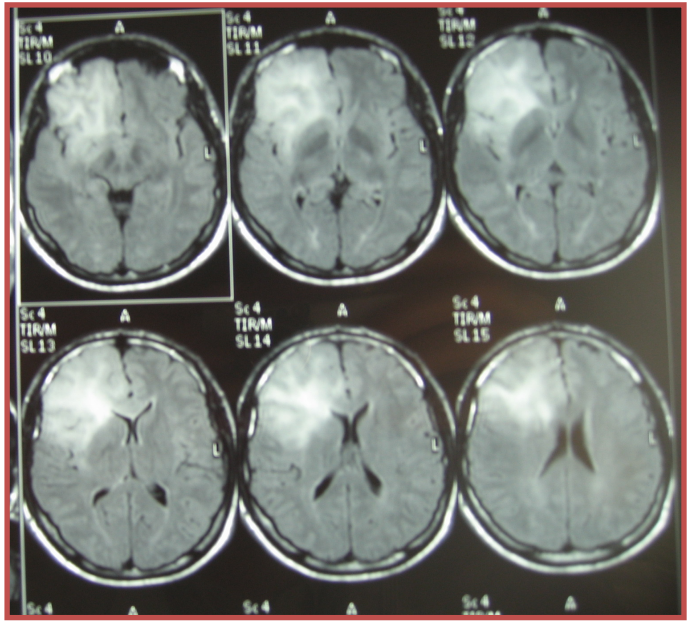
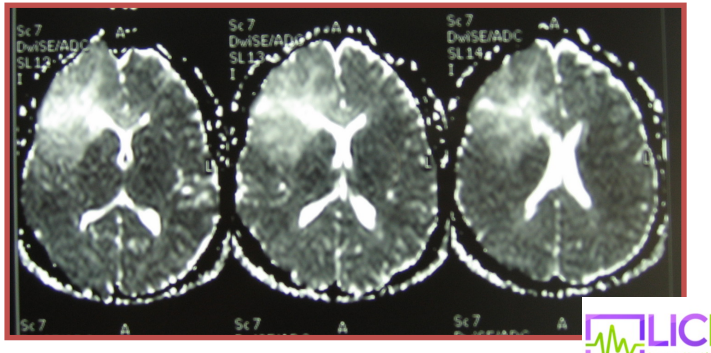


Figura 1. Paziente di 35 anni con astrocitoma a lento accrescimento, a primitiva insorgenza in sede frontale destra. Primi sintomi clinici insorti oltre vent'anni prima, sotto forma di crisi epilettiche focali secondariamente generalizzate. Tutti gli EEG hanno documentato scarse alterazioni patologiche. In alcuni tracciati è stata rilevata la comparsa di sporadiche sequenze di potenziali lenti ritmici a 2 Hz in sede frontale di destra.









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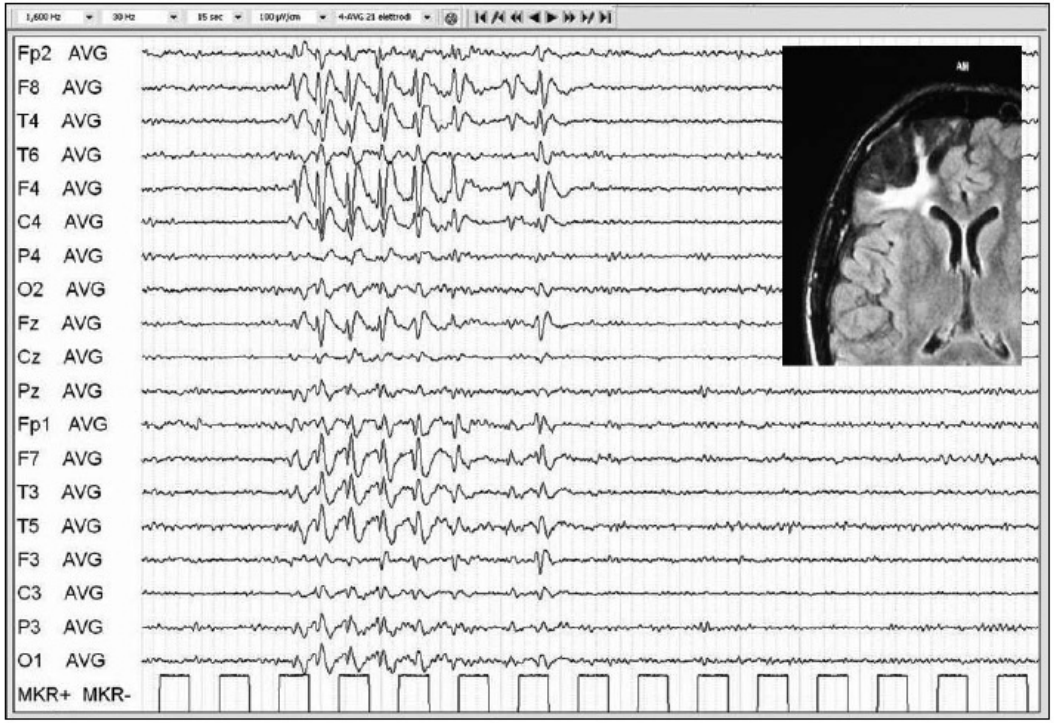
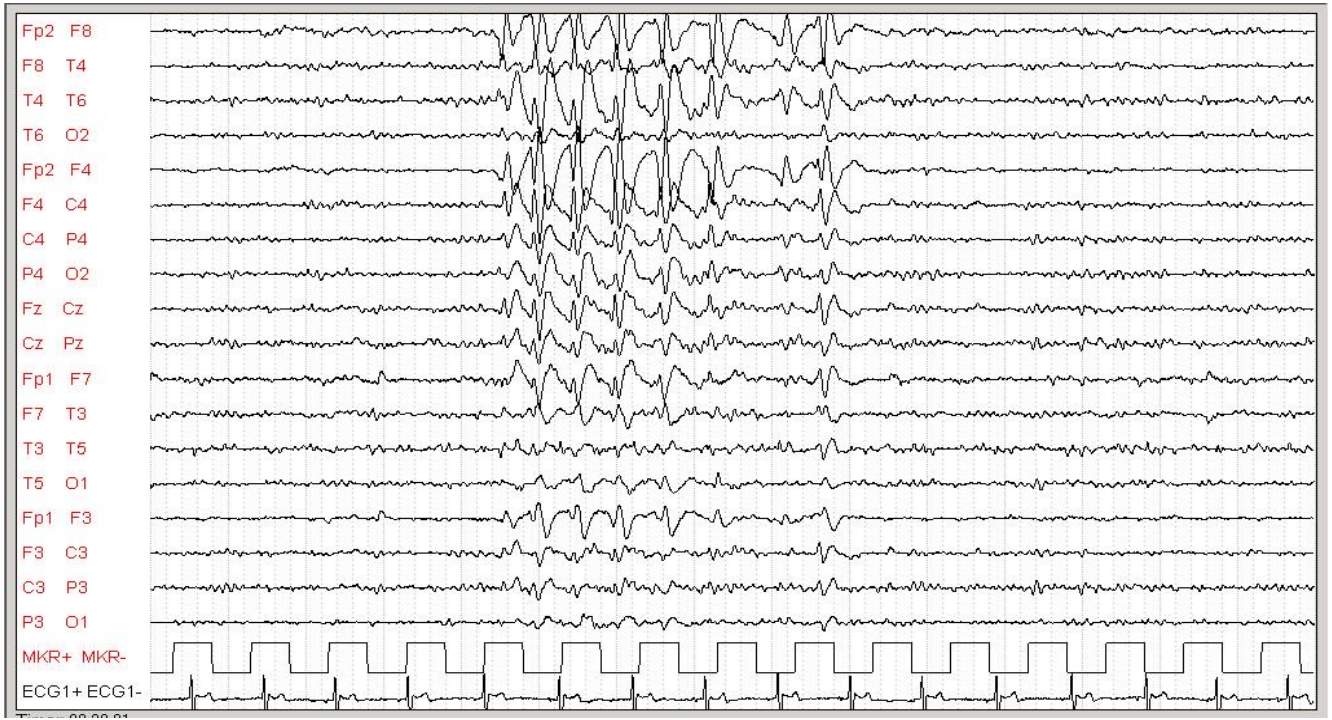
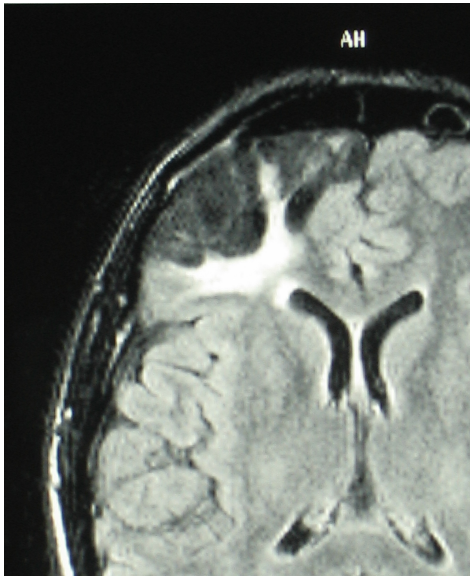


Figura 4. Paziente di di 32 anni con presenza in anamnesi di trauma cranico con focolaio contusivo frontale destro. Prima crisi epilettica parziale con generalizzazione secondaria 30 mesi dopo. La risonanza magnetica evidenzia l'esito della lesione cerebrale post-traumatica. L'EEG intercritico (a distanza di oltre 4 anni dal trauma) mostra un focolaio epilettogeno attivo in sede frontale e temporale anteriore di destra, che tende a trasmettere controlateralmente. Le crisi sono attualmente sotto controllo con terapia farmacologica.

ISBN 978-88-7556-427-8


Fp2 F8
F8 T4
T4 T6
T6 O2
Fp2 F4
F4 C4
C4 P4
P4 O2
Fz Cz
Cz Pz
Fp1 F7
F7 T3
T3 T5
T5 O1
Fp1 F3
F3 C3
C3 P3
P3 O1
MKR+ MKR-
ECG1+ ECG1-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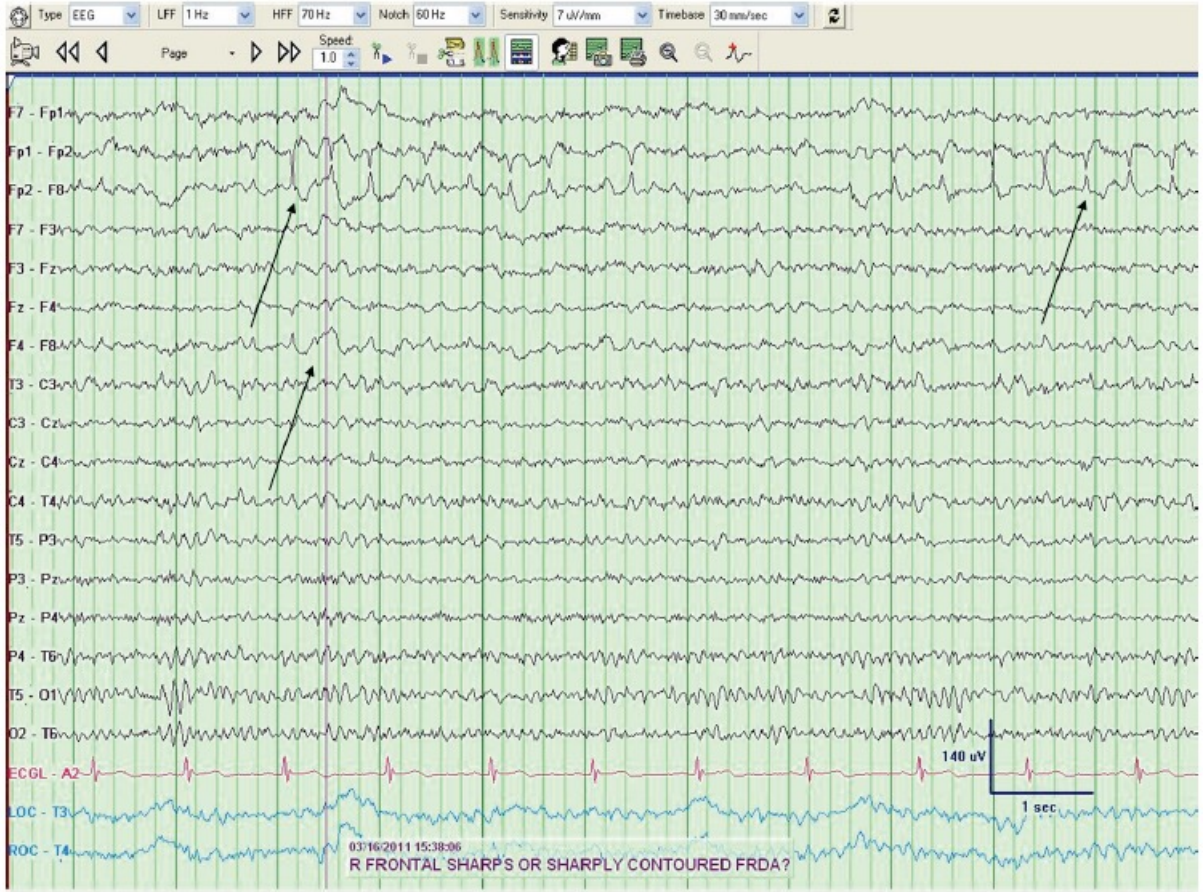


M. Koutroumanidis, *et al.*

Epileptic Disord, Vol. 19, No. 3, September 2017

Figure 5.14. Frequent right fronto-polar spikes in a patient with post-traumatic epilepsy and bilateral orbitofrontal encephalomalacia on brain MRI. Note the very focal field identified using a transverse bipolar montage (arrows).

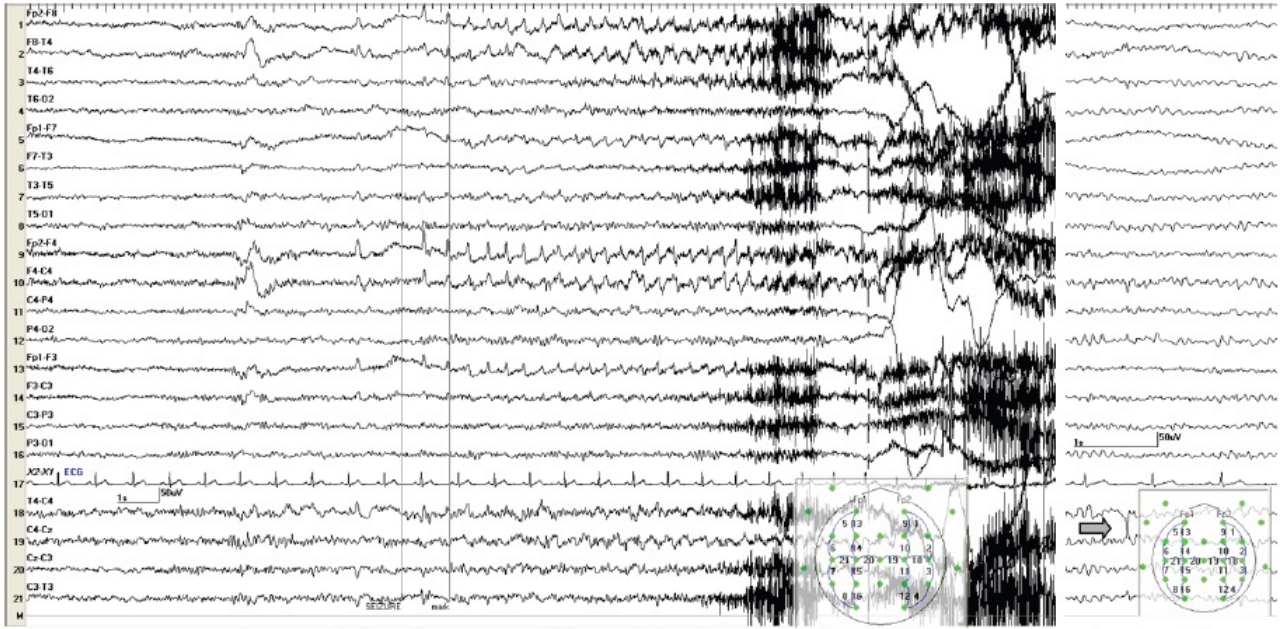
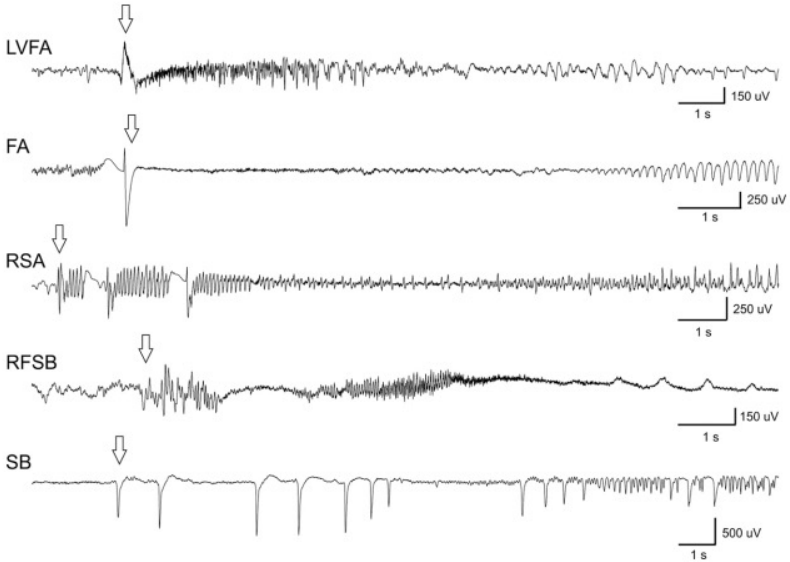


Figure 5.21. Left panel: ictal EEG with a right frontal lobe seizure in a patient with post-traumatic epilepsy. Ictal symptoms included headache, gustatory hallucinations associated with "sickness" and "emptiness in his head". He remained conscious and responsive throughout the attack that lasted one minute. Right panel: postictal slowing over the right anterior quadrant persisted for 20 minutes without any associated symptoms. Interictal spikes occurred over the right central area (arrow).

Seizure: European Journal of Epilepsy 72 (2019) 54–60

Stereo-EEG ictal/interictal patterns and underlying pathologies

Roberta Di Giacomo[a,b,*,1], Reinaldo Uribe-San-Martin[b,c,1], Roberto Mai[b], Stefano Francione[b], Lino Nobili[b], Ivana Sartori[b], Francesca Gozzo[b], Veronica Pelliccia[b], Marco Onofrj[d], Giorgio Lo Russo[b], Marco de Curtis[a], Laura Tassi[b]



Low Voltage Fast Activity

Fast Activity

Rhythmic Sharp Activity

Repetitive Fast Spikes Bursts

Slow Burst of Polyspikes

Fig. 1. Seizure Onset Zone Stereo-EEG patterns. LVFA: *Low-voltage fast activity* with slow DC shift; FA: *Fast activity;* RSA: *Rhythmic sharp activity;* RFSB: *Repetitive fast spikes bursts;* SB: *Slow burst* of polyspikes. Seizure onset is marked by the arrow. Bipolar montage.

Interictal regional paroxysmal fast activity on scalp EEG is common in patients with underlying gliosis

Gopal Krishna Dash [a,1], Chaturbhuj Rathore [a,*,2], Malcolm K. Jeyaraj [a,3], Pandurang Wattamwar [a,4], Sankara P. Sarma [b], Kurupath Radhakrishnan [a,5]

Clinical Neurophysiology 129 (2018) 946–951

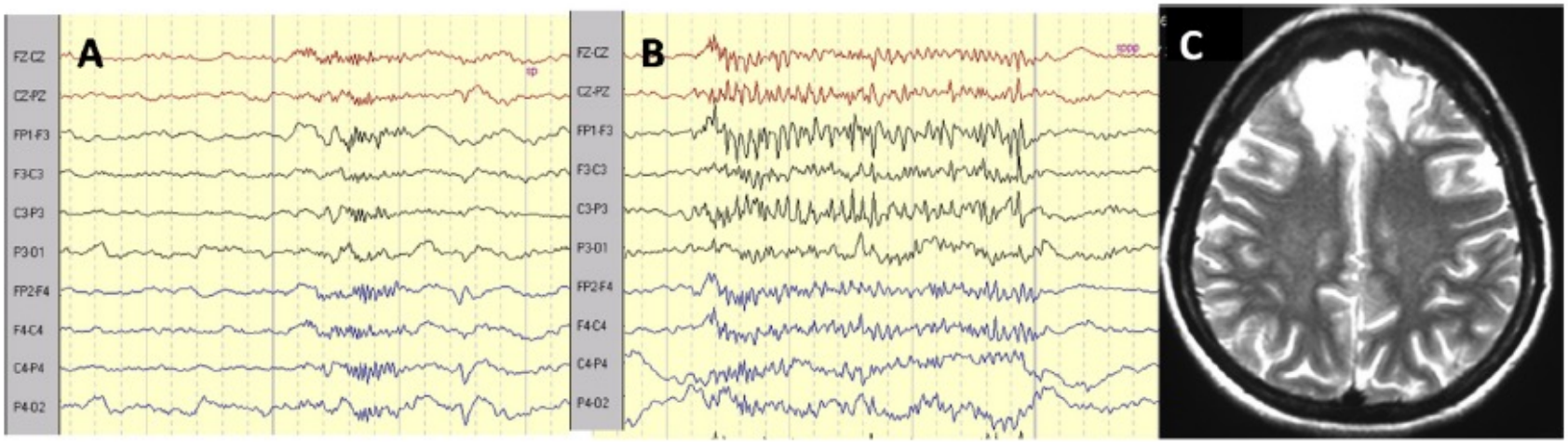


Fig. 3. Interictal EEG in longitudinal bipolar montage showing regional paroxysmal fast activity predominantly over the left frontal region (A, B) in a patient with post-traumatic bifrontal gliosis as noted on axial T2W MRI sequence (C).

Different faces of frontal lobe epilepsy: The clinical, electrophysiologic, and imaging experience of a tertiary center

O. Erturk Cetin et al.

Table 4
Seizure characteristics and ictal patterns.

	Seizure (n = 146)
Seizure type	
Focal motor/nonmotor	110
Bilateral tonic clonic	18
Subclinical	18
Duration (seconds)	
Focal	36.2 *(6–90)*
fBTC	95.8 *(70–150)*
Relation to sleep	
Sleep	83 (56.8 %)
Awake	63 (43.1 %)
Ictal patterns	
Rhythmic alpha/theta	31 (21.2 %)
Rhythmic delta	24 (16.4 %)
Repetitive spikes	17 (11.6 %)
Fast activity	15 (10.2 %)
Suppression	4 (2.7 %)
Artifacts	55 (37.7 %)

fBTC, Focal to bilateral tonic clonic.

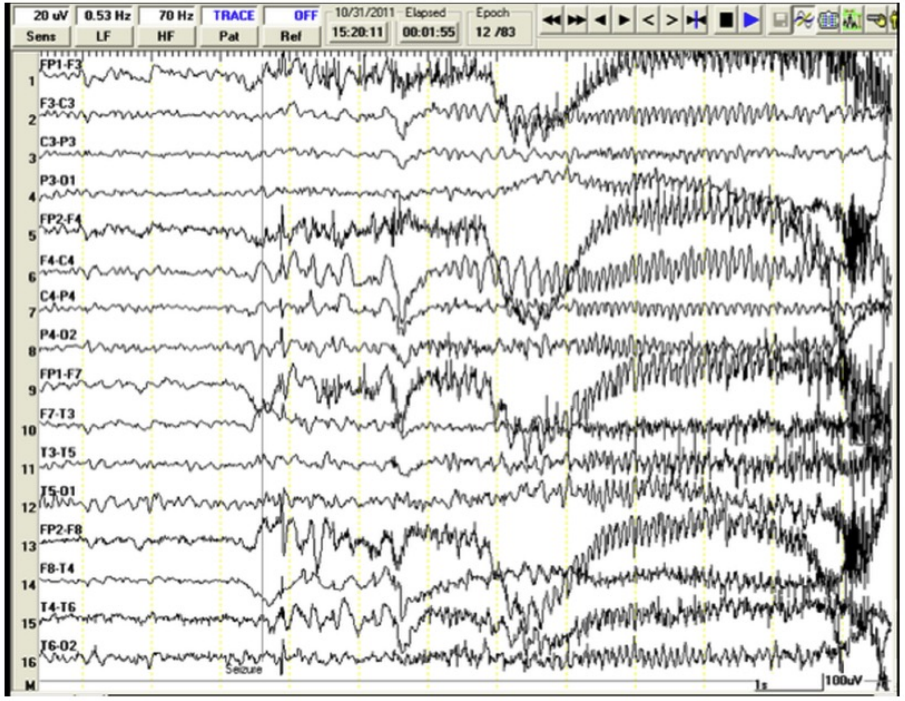


Fig. 1. Female patient aged 16 yrs with normal MRI. Ictal EEG shows 3.5-4 Hz spike and wave activity prominent in right hemisphere frontal regions, spreading to the left hemisphere anterior regions; followed by generalized 9-10 Hz rhythmic activity prominent over the frontal regions. In 8 s, muscle artifacts are seen in all regions.

Different faces of frontal lobe epilepsy: The clinical, electrophysiologic, and imaging experience of a tertiary center

Clinical Neurology and Neurosurgery 203 (2021) 106532

Results: We have evaluated 146 seizures in 36 patients (17 lesional and 19 non-lesional according to MRI). There were 110 focal motor or nonmotor seizures, 18 bilateral tonic-clonic seizures, and 18 subclinical seizures. There were 16 patients with aura. The most common semiologic feature was hyperkinetic movements. Among the interictal EEGs, 30.5 % included focal anomalies. Among the ictal EEGs, 69.1 % were non-localizing or lateralizing. The most common ictal pattern was rhythmic theta activity (21.2 %). In four patients, who had non-localizing or lateralizing EEG, the postictal EEG was informative. Our study showed a low percentage of localized FDG-PET, which, however, involved visual analysis.

Conclusion: Our results support the previously known difficulties in the determination of the epileptogenic zone of FLE. Semiologic and electrophysiologic correlation studies, longer postictal records, and quantitative analysis of FDG-PET may contribute to a better characterization of the disease.

The additional lateralizing and localizing value of the postictal EEG in frontal lobe epilepsy

Kimberley Whitehead [1], Stephanie Gollwitzer [2], Helen Millward [3], Tim Wehner [4], Catherine Scott [3], Beate Diehl [4]

Clinical Neurophysiology
Volume 127, Issue 3, March 2016, Pages 1774-1780

Highlights

- Our study revealed that 47/96 (49%) postictal periods contained lateralizing or localizing information.
- In 14/38 (39%) patients, at least one seizure with an unhelpful ictal EEG was followed by postictal EEG features with new lateralizing information.
- In frontal lobe epilepsy, close examination of the postictal EEG can offer additional information to identify a potentially resectable epileptogenic zone.

Clinical Neurophysiology
Volume 127, Issue 3, March 2016, Pages 1774-1780

Table 2: Frequency of postictal features in all seizures analysed (n=96)

Asymmetrical return of posterior dominant rhythm	25/96 Mislateralised in 3/25 (these 3 were the only postictal periods which mislateralised)		
Lateralised slow	6/96		
Regional slow	22/96		
Lateralised spikes	4/96		
	3/4 activated in frequency	1/4 more lateralised field whereas widespread before	
Regional spikes	19/96		
	9/19 activated in frequency	9/19 more restricted frontal field (only lateralized before)	1/19 new frontal spike population
Any 1 feature	50/96		
2 or more features	22/96		

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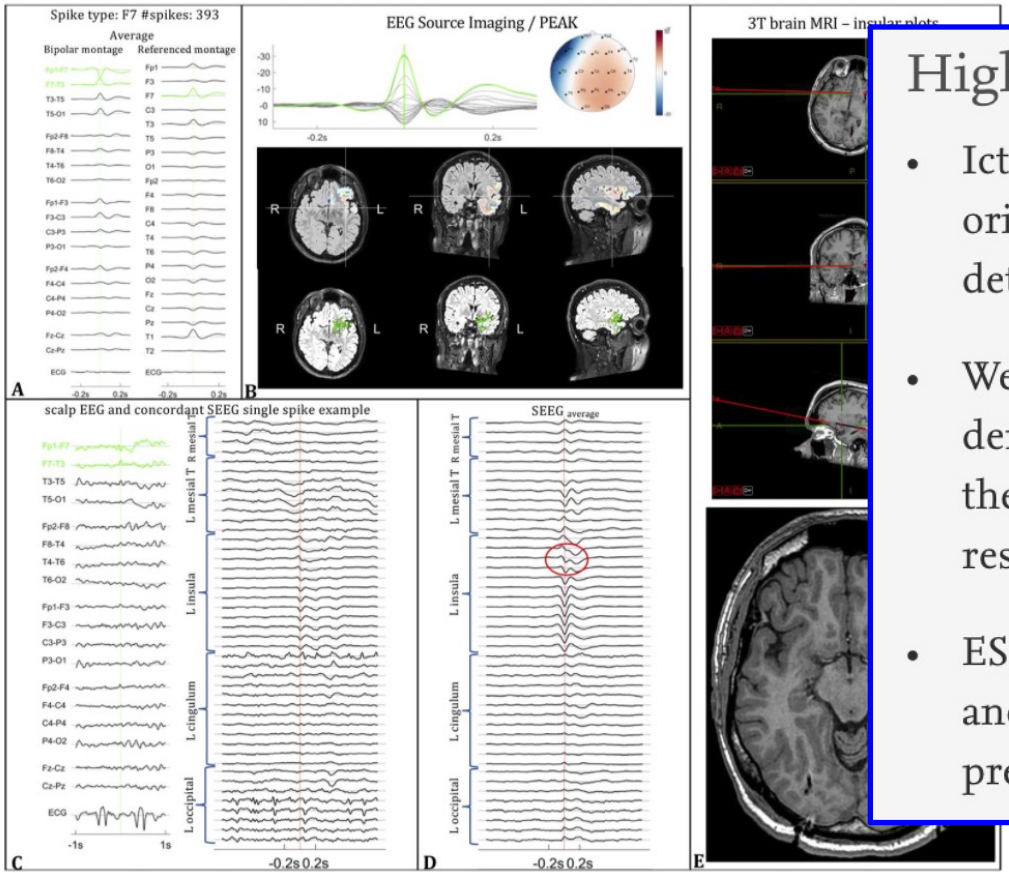
Clinical Neurophysiology
Available online 4 October 2021
In Press, Journal Pre-proof

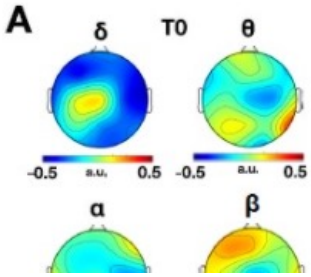


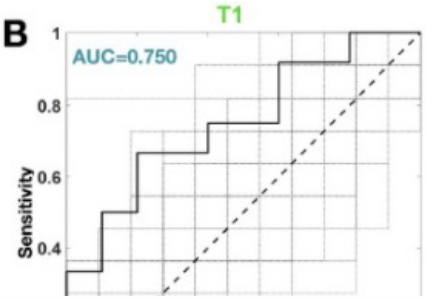
Highlights

- Ictal or interictal epileptiform discharges originating in the insula are difficult to be detected by scalp EEG.
- We evaluated the accuracy of automated low density electrical source imaging (ESI) to define the insular irritative zone by comparing ESI results with concomitant stereo-EEG.
- ESI showed 53% overall accuracy, 55% specificity and 53% sensitivity and might be a useful tool in presurgical evaluation.

Clinical Neurophysiology
Available online 13 October 2021
In Press, Journal Pre-proof

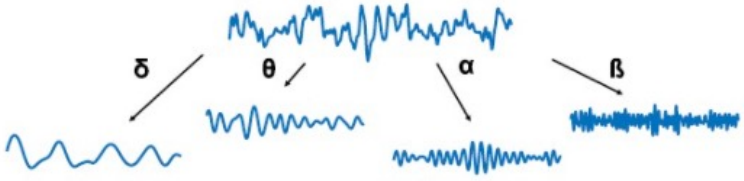
Machine learning for predicting levetiracetam treatment response in temporal lobe epilepsy





EEG RECORDINGS T0/T1 THERAPY

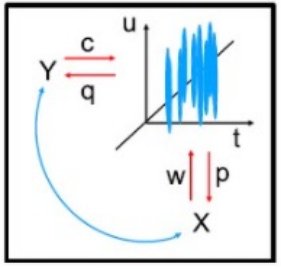
FEATURES EXTRACTION



Standard Deviation for 4 Frequency Bands and for 19 Channels for T0 and T1 recordings: 152 features

MACHINE LEARNING

Partial Least Square (PLS) Regression

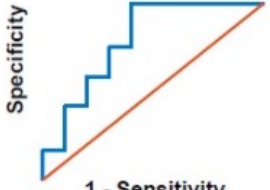


Nested Leave-One-Out Cross-Validation (nLOOCV)

BIOMARKER MODEL SELECTION

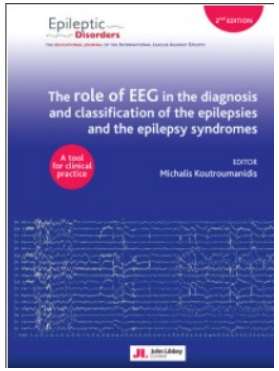
Model Weights

Model Output (Biomarker)



EEG → **EEG FEATURES** → **MACHINE LEARNING**

CONCLUSIONI



Epilessie del Lobo Frontale (FLE)

Protocolli per la registrazione

Livello BASE

- Dopo S-EEG tentare di registrare in sonno (privazione di sonno)
- Applicare elettrodi linea mediana – EMG muscolo deltoide e degli arti
- Prove di attivazione: più dimostrativa HV

Livello AVANZATO

- Registrare un periodo sufficientemente lungo di sonno N2 (per evidenziare IEDs, scariche subcliniche o crisi elettro-cliniche (applicare elettrodi per EMG)
- Se possibile utilizzare un maggior numero di elettrodi (SI 10-10)
- Ripetere un EEG in SD prima possibile dopo una crisi (>24h)

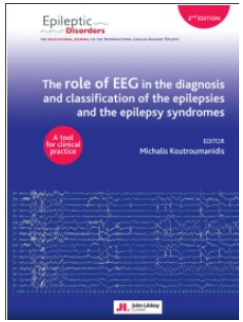
EEG - Livelli Diagnostici

difficoltà:

- Pattern Interictali molto variabili (dall'EEG normale a IEDs regionali/lateralizzate o bilaterali (sincronia bilaterale secondaria)
- Pattern Ictali difficili spesso da interpretare per la massiva attività motoria (artefatti)

EEG Confirmatorio

- EEG ictale con scarica critica focale in sede frontale (per es. attività focale ictale rapida - > 13 Hz - di basso voltaggio)
- IEDs in sede frontale, unilaterali o bilaterali ma asimmetriche (associate con lesione frontale alla RM)



Negli altri casi (> EEG interictale normale, sospetto di PNES, etc) indicazione per EEG prolungati/Video-EEG telemetria

Epileptic Disord, Vol. 19, No. 3, September 2017

M. Koutroumanidis, *et al.*

Epileptic Disorders

The Educational Journal of the ILAE International League Against Epilepsy

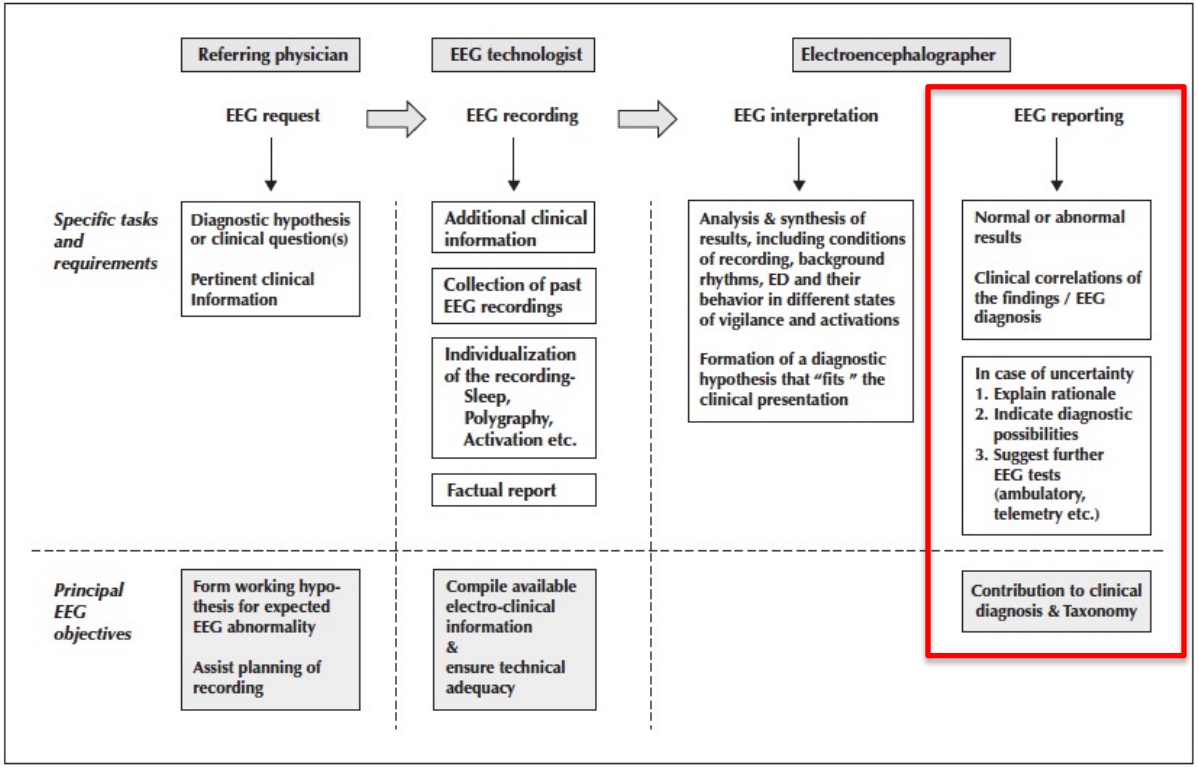


Figure 1.01. EEG diagnostic pathway; from the initial referral to the final report. The white boxes in the upper row show the main tasks and requirements in each stage of the orderly EEG process from the initial request to the final report to maximize its diagnostic contribution. For example, individualization of the recording relies on the completeness of the diagnostic hypothesis of the referring physician and the provided clinical information on the request form, but also on additional information obtained by the EEG technologist (*see section 1.4 in the text*). The grey boxes in the lower row show the main objectives of each stage of the EEG process, culminating in the important role of the EEG in clinical diagnosis and taxonomy.

Clinical Neurophysiology Practice 2 (2017) 170–185

Contents lists available at ScienceDirect

Clinical Neurophysiology Practice

journal homepage: www.elsevier.com/locate/cnp

A revised glossary of terms most commonly used by clinical electroencephalographers and updated proposal for the report format of the EEG findings. Revision 2017

Nick Kane [a,*], Jayant Acharya [b], Sandor Beniczky [c], Luis Caboclo [d], Simon Finnigan [e], Peter W. Kaplan [b], Hiroshi Shibasaki [f], Ronit Pressler [a], Michel J.A.M. van Putten [g]