La TEP au ^{18}FDG dans les différents sous-types d'épilepsies du lobe temporal : validation en SEEG et valeur prédictive post-opératoire

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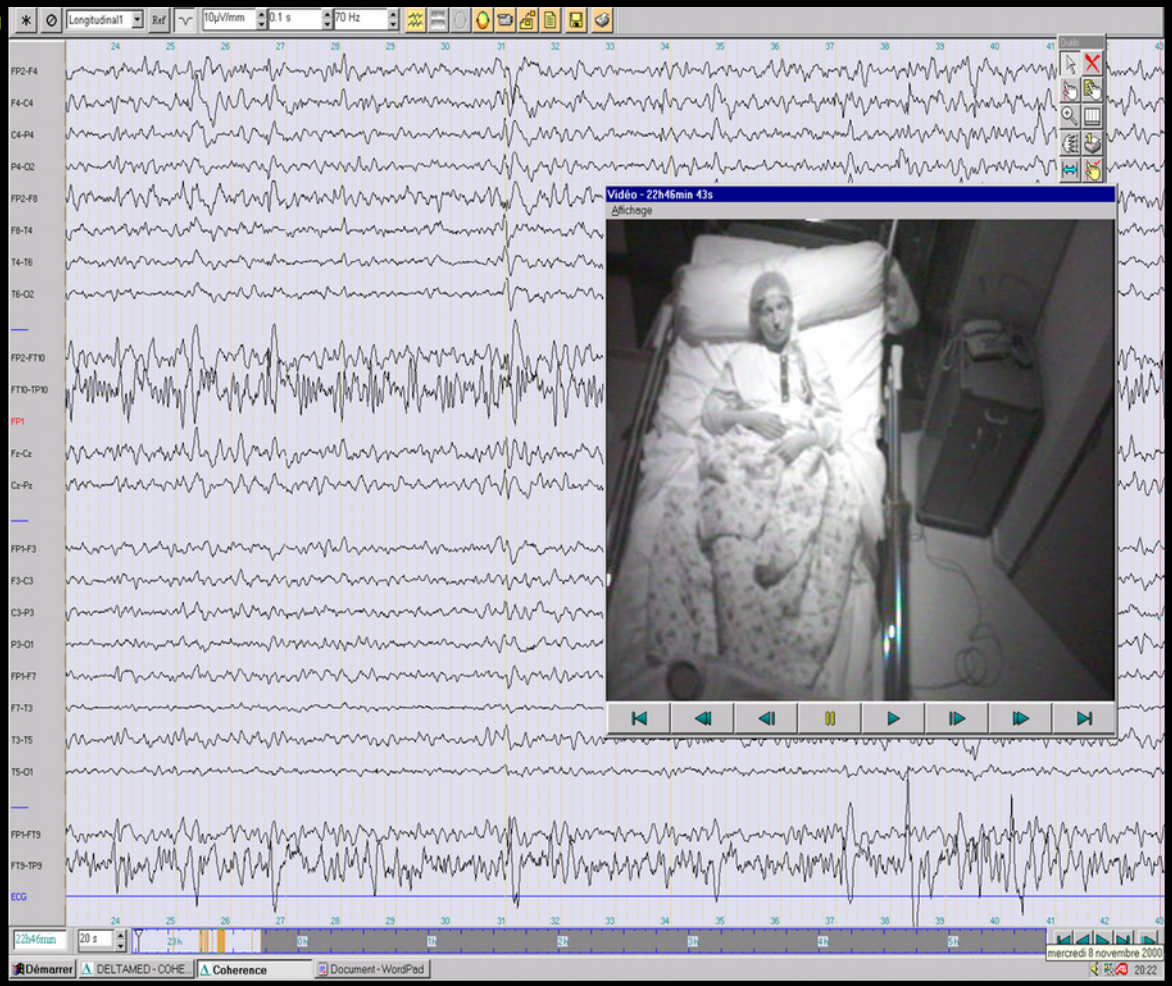
Temporal Lobe Epilepsy

- The most common form of localization-related epilepsy
- Pharmaco-resistant in 45%
  - uncontrolled ictal seizures
  - interictal neuropsychological deficits
- **Temporal lobectomy has dramatically improved the quality of life of patients with TLE** (*seizure freedom between 46% and 81% at 1 year following surgery, and up to 72% at 10 years*):
  - demonstrated in a randomized controlled trial, vs medical treatment
- **Prior to surgery, evaluations are performed** to :
  - identify the epileptogenic zone (*the brain area necessary and sufficient for the generation of habitual ictal events*)
  - distinguish this from propagation pathways
  - determine its relationship with functional cortical areas

Foldvary et al., Neurology 2000; Wiebe et al., NEJM 2001; Yoon et al., Neurology 2003; Cascino, Epilepsy Res 2004; Jeha et al., Neurology 2006

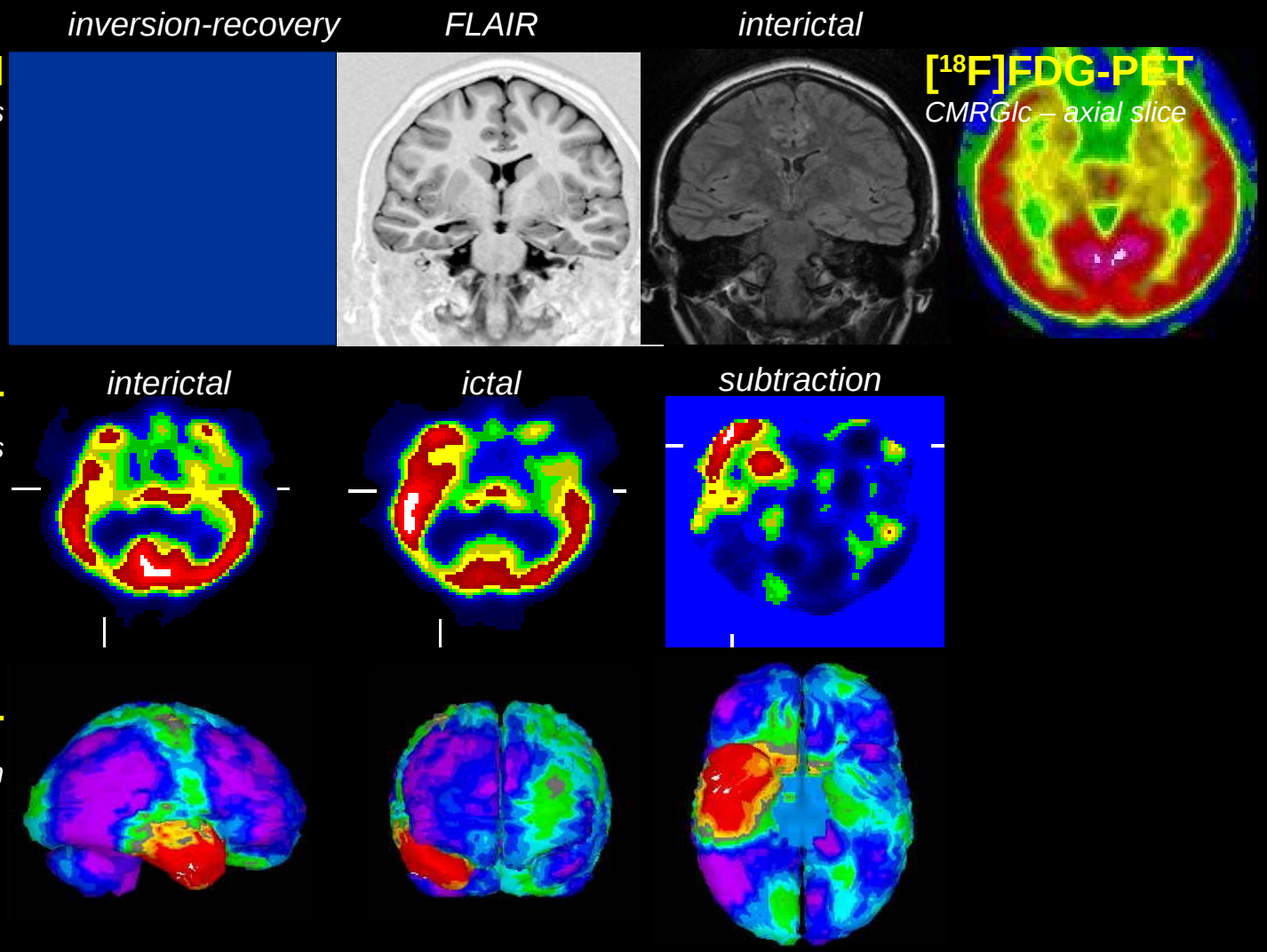
Phase I non-invasive evaluation

Video-EEG



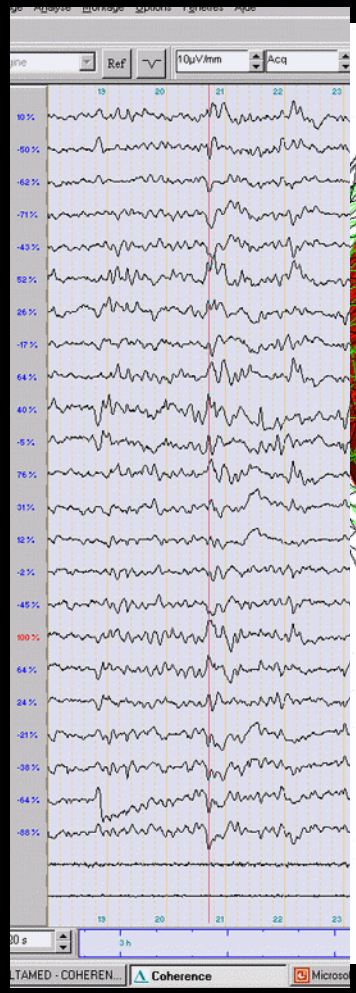
Electro-clinical correlations

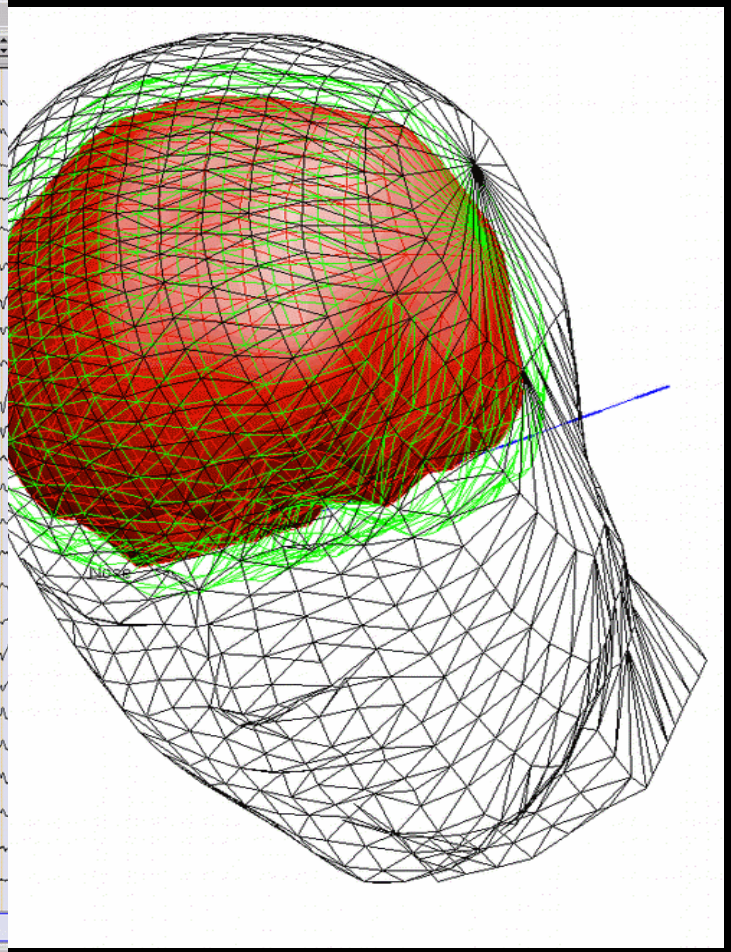
Phase I non-invasive evaluation



Phase II invasive evaluation

SEEG





Invasive and non-invasive presurgical investigations have permitted to identify TLE with distinct EZ (mesial, lateral, temporal *plus* or bilateral subtypes), leading to distinct temporal resections

Barba et al., Brain 2007; Bartolomei et al., Epilepsia 2010

Methods

- 54 consecutive patients with pharmaco-resistant TLE retrospectively enrolled after presurgical evaluation including SEEG for all patients
- 7 lateral, 17 mesial, 14 “plus”, and 16 bilateral TLE
- Whole-brain voxel-based brain PET metabolism studied in each subgroup of patients, in comparison to 23 healthy subjects using SPM (*EZ flipped to the same hemisphere; cerebellar normalization*)
- Individual classification evaluated by cross-validation using found clusters
- Logistic regression analysis was used to estimate factors associated with post-operative outcome (Engel’s classes III–IV vs. I–II), including age, disease duration, seizure frequency, as well as MRI and PET (*the individual Z-score of the most significant cluster*)

^{18}FDG-PET in different subtypes of temporal lobe epilepsy: SEEG validation and predictive value

*†‡Eric Guedj, §¶Francesca Bonini, §¶Martine Gavaret, §¶Agnès Trébuchon, §¶Sandrine Aubert, #Mohamed Boucekine, #Laurent Boyer, **Romain Carron, §¶Aileen McGonigal, and §¶Fabrice Bartolomei

Epilepsia, 56(3):414–421, 2015
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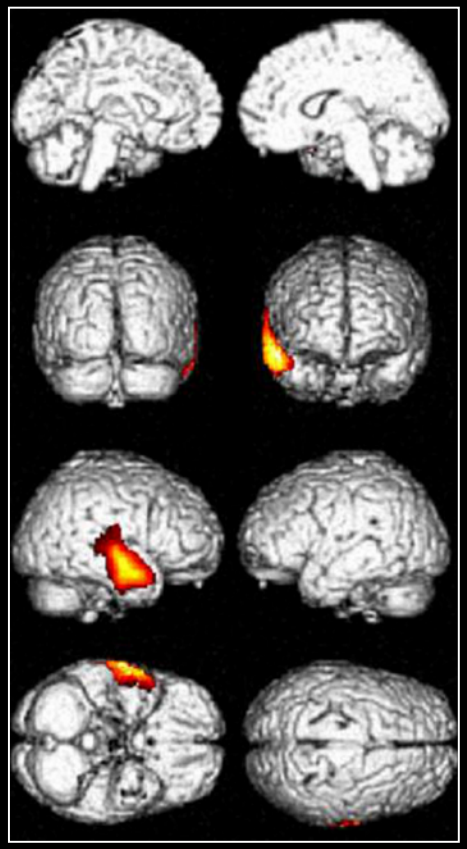

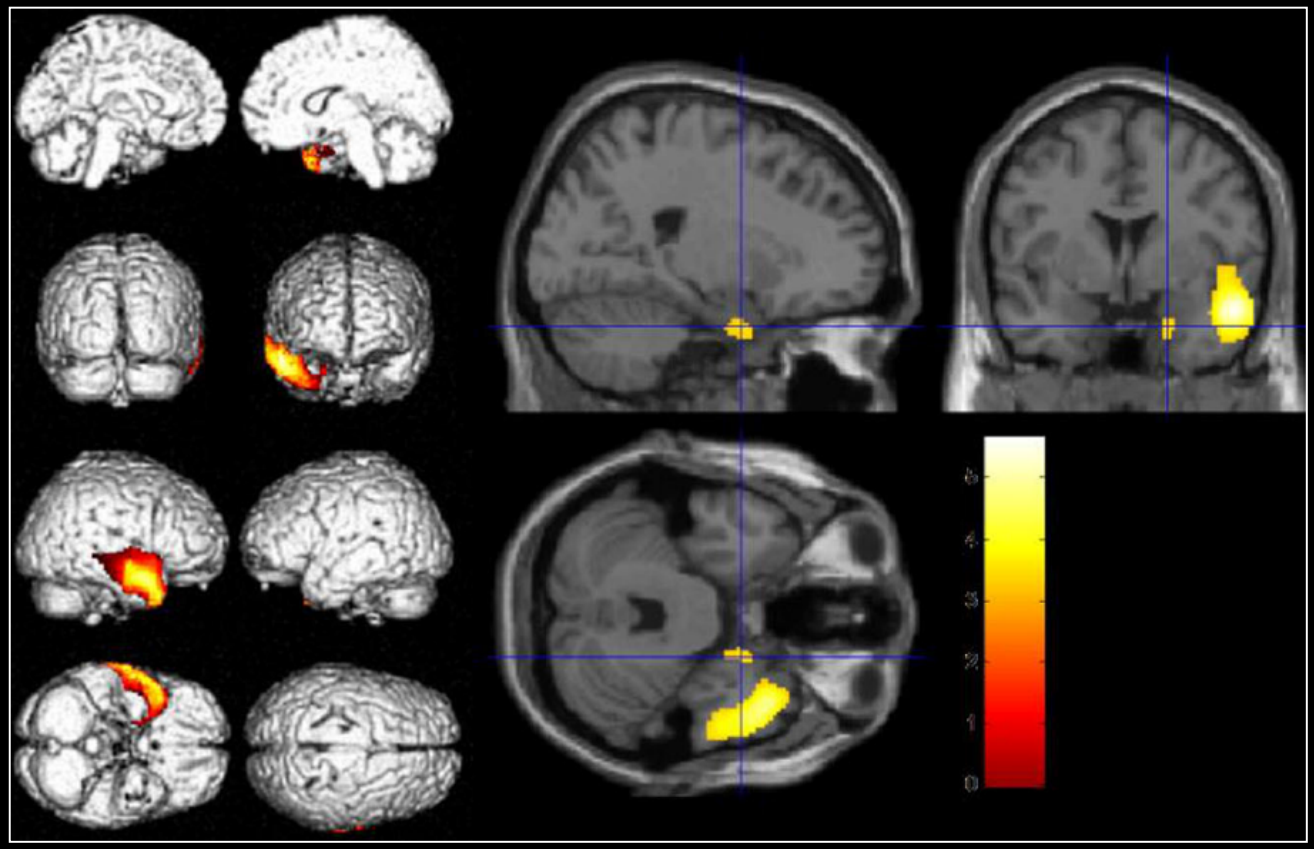

Lateral TLE

Mesial TLE

p < 0.001, corrigé pour le cluster

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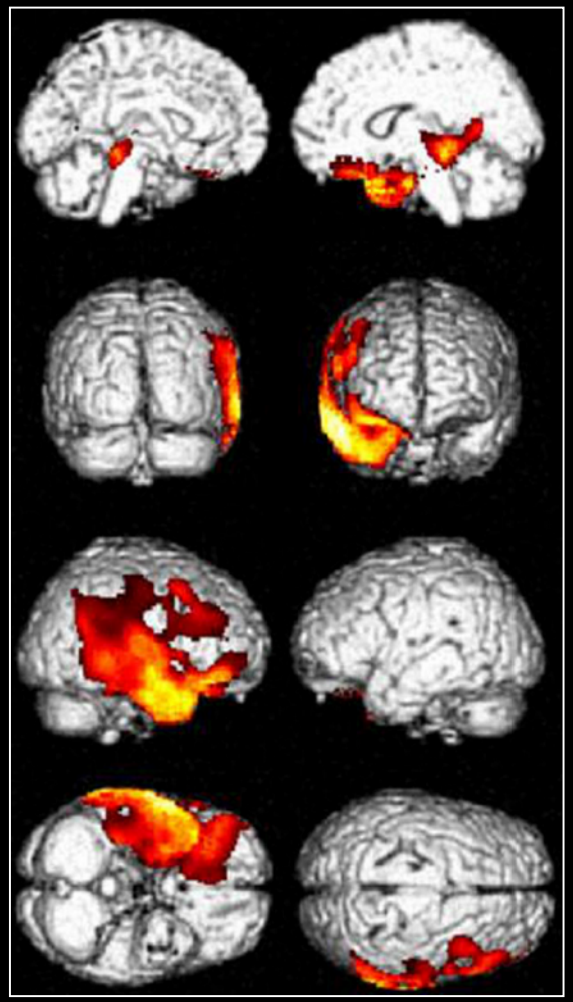
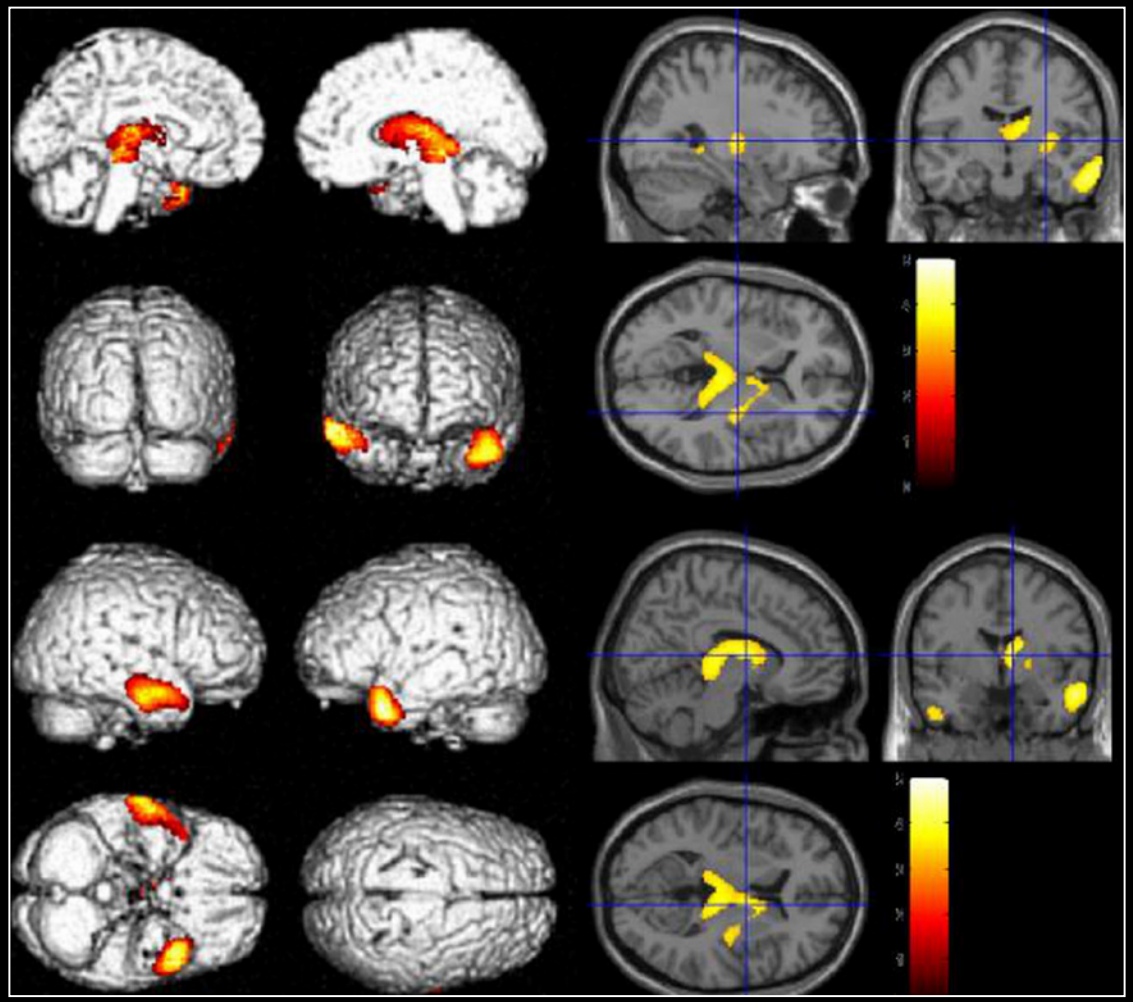


« *plus* » TLE



Bilateral TLE

p < 0.001, corrigé pour le cluster

On the whole, at subgroup level …

- The medial temporal cortex was spared in lateral TLE
- Extratemporal cortical involvement was found only for *plus* TLE
- Bilateral involvement was found only for bilateral TLE
- Subcortical involvement was only found for bilateral TLE

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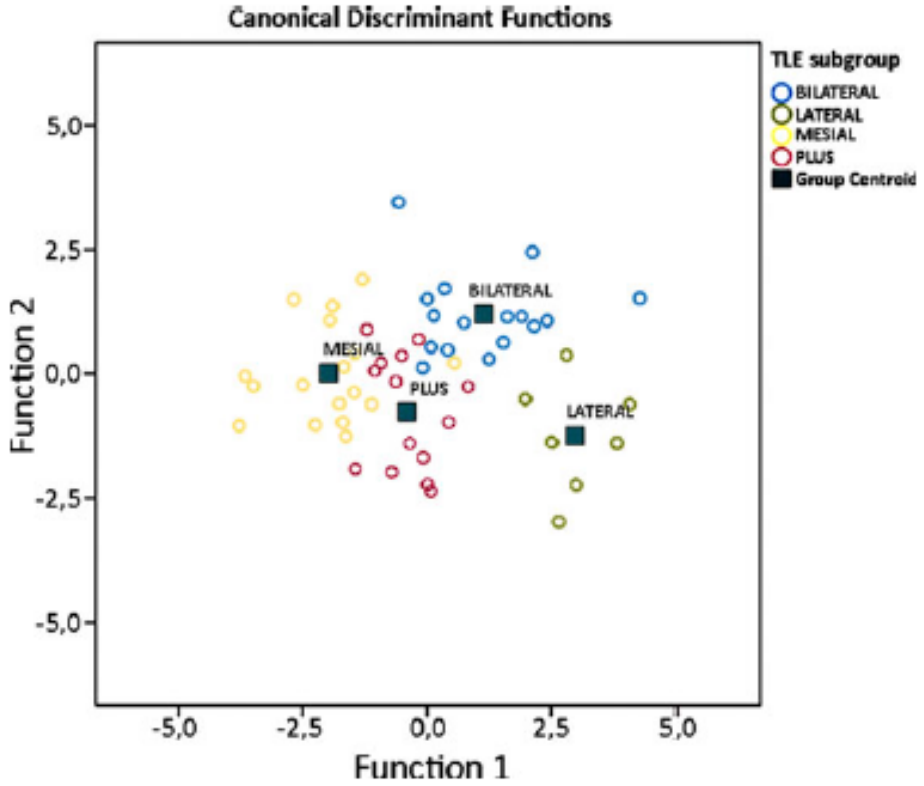

The cross-validated results showed significant discrimination for the four groups, with satisfactory overall accuracy (87.5% were correctly classified for bilateral and lateral TLE, 88.2% for mesial TLE, and 71.4% for "plus" TLE).

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Table 1. Factors associated with postoperative outcome (Engel's classes: III–IV vs. I–II): univariate and multivariate analysis

	Engel's classes: I–II M (SD) or P	Engel's classes: III–IV M (SD) or P	p-Value	Adjusted OR [95% CI][a]	p-Value
Age	31.3 (17.2)	29.3 (12.7)	0.878	0.99 [0.93;1.06]	0.770
Gender (female)	55.0	30.0	0.260	0.24 [0.03;1.84]	0.171
Illness duration	16.9 (14.6)	12.7 (9.0)	0.758	–	–
Seizure frequency	14.0 (22.8)	13.0 (14.0)	0.565	–	–
MRI (normal)	45.0	70.0	0.260	0.88 [0.10;7.52]	0.905
FDG-PET index	−7.7 (2.1)	−5.6 (1.2)	0.006	1.95 [1.04;3.65]	**0.037**

P, percentage; M (SD), mean ± standard deviation. Significant p-values ($p < 0.05$) are in bold.
[a]Adjusted OR [95% CI]: adjusted odds ratio [95% CI].

Swartz et al., Epilepsia 1992 ; Struck et al., Epilepsy Behav 2011

Conclusions

- Specific patterns of interictal hypometabolism, inside and outside the EZ:
  - in distinct subgroups of TLE patients
  - as defined by SEEG gold standard
  - in relation with post-operative outcome

Thank you for your attention !

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