An Italian multi-center structural MRI study on sporadic lateral temporal lobe epilepsy

A. Sarica[1], R. Vasta[2], F. Bisulli[3], J. Di Francesco[4], G. Di Gennaro[5], A. D'Aniello[5], L. Mumoli[6],
A. Quattrone[6], A. Gambardella[6], A. Labate[6]

[1] IBFM, Neuroimaging Unit, National Research Council, Catanzaro, Italy. [2] Centro di Ricerca in Neuroscienze, University Magna Graecia, Catanzaro, Italy. [3] IRCCS Istituto delle Scienze Neurologiche, Department of Biomedical and Neuromotor Sciences, University of Bologna. [4] Department of Neurophysiology, Foundation Neurological Institute C. Besta, Milano. [5] IRCSS – Neuromed, Pozzilli. [6] Institute of Neurology, University Magna Graecia, Catanzaro, Italy.

Objective

> Lateral temporal lobe epilepsy (LTE), familial or sporadic, is a rare condition characterized by auditory auras as simple sounds or complex hallucinations, and negative MRI findings and relatively benign evolution [1]. Since the low number of cases in the world, our objective is to analyze a cohort of sporadic LTE (sLTE) from different sites, in order to investigate cerebral morphological alterations.

Materials

> 40 sLTE (mean age 34.93 ± 12.08) and 38 age- and sex-matched healthy controls (CTRL, mean age 34.55 ± 9.08) were enrolled from four epilepsy-specialized italian centers (Catanzaro, Bologna, Milano, Pozzilli), which provided T1-weighted images following a standard protocol for epileptic patients.

Methods

> We performed group comparison by following two different approaches: (i) voxel-based morphometry (VBM, SPM8) and (ii) cortical thickness (CT) and local gyrification index (lGI) (FreeSurfer 5.3). To minimize image variability caused by different scanners, we added as covariates of non-interest in a General Linear Model (GLM), for both approaches, 9 meta-data parameters in common among centers [2]. Furthermore, data were adjusted for age, sex and total intracranial volume.
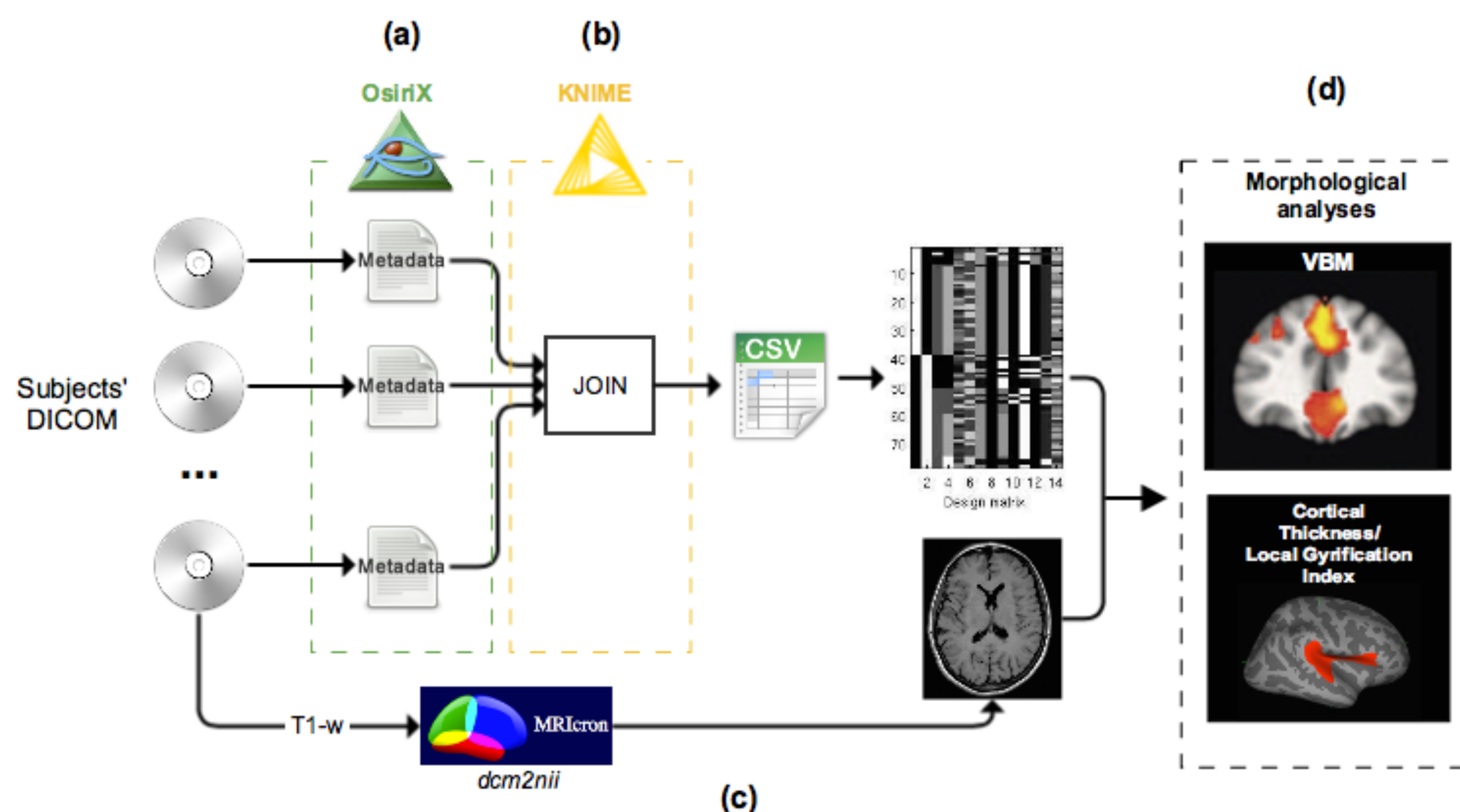
Fig. 1 Workflow of analysis. (a) Structural (T1-weighted) DICOMs from the four centers were used for extracting header meta-data by using OsiriX software tool and saved as text file for each subject. (b) All subjects' text files containing the acquisition parameters were joined together by using KNIME software. (c) T1-weighted DICOMs were converted into NIfTI format by using the tool *dcm2nii*. (d) The table containing scanner parameters, in common among subjects, together with center name and manufacturer name, was used as covariates (11 in total) in the design matrix of General Linear Model in voxel-based (VBM), cortical thickness and local gyrification index analyses, adjusting data for total intracranial volume

Results

> At a more conservative threshold ($p < 0.05$, FWE correction), no significant differences between groups survived, neither in VBM nor CT/lGI. Using a lower threshold ($p<0.001$, uncorrected), gray matter alteration over the occipital lobe bilaterally (calcarine cortex) and left frontal lobe (anterior cingulum) was observed with VBM analysis. only.

Conclusions

> Multi-center studies have more power than smaller studies in conducting sophisticated evaluations of rare diseases. We minimized image variability caused by different scanners by using acquisition parameters as covariates of non-interest in GLMs. None significant differences were captured in the whole brain gray matter among patients with sLTE.

> The statistical approach we used for conducting this multi-site study resulted to be reliable and robust for analyzing morphological group differences. On the other hand, since no significant alterations were found, we suggest to apply a multi-modal approach with the aim of exploring a possible microstructural damage.

References

1. Michelucci, R., Pasini, E., Nobile, C. (2009) Lateral temporal lobe epilepsies: clinical and genetic features. Epilepsia, 50 Suppl 5:52-4.
2. Chen, J., Liu, J., Calhoun, V.D., Arias-Vasquez, A., Zwiers, M.P., Gupta, C.N., Franke, B., Turner, J.A. (2014) Exploration of scanning effects in multi-site structural MRI studies. J Neurosci Methods, 230:37-50.

XLVII CONGRESSO NAZIONALE
22-25 OTTOBRE 2016 – VENEZIA

Sin