

localization, with both of these being particularly important in children. Seizures are uncommon during PET scans and different ictal metabolic patterns have been reported in few children. We report on the utility of ictal PET/CT in the management of two patients with recurrent frequent non convulsive seizures.

Methods: [¹⁸F] flourodeoxyglucose ictal PET/CT was performed in two children with refractory non convulsive status epilepticus. Continuous scalp EEG monitoring was used during the tracer uptake period to confirm the ictal state and to assist in the interpretation of the FDG uptake.

Results: Patient #1: 32 month old with partial seizures since age 1 year presented with deteriorating level of consciousness and recurrent episodes of confusion. MRI was normal. Video EEG revealed right hemispheric almost continuous electrographic seizures. Patient had failed treatment with Midazolam drip, Phenobarbital, Isoflurane anaesthesia and Topiramate. PET/CT was performed with continuous scalp EEG recording. Two diffuse right hemispheric electrographic seizures were recorded 20 minutes and one minute prior to the injection and a third electrographic seizure was captured during the scanning. PET/CT revealed an area of hypermetabolism in the right middle frontal gyrus. The patient underwent invasive monitoring with subdural electrodes which confirmed PET scan results. The patient is seizure free at one year follow up after right frontal resection. Pathological diagnosis was non-balloon cell cortical dysplasia.

Patient # 2: 10 year old with tuberous sclerosis complex and recurrent episodes of status epilepticus with minor convulsive features. He had previously failed corpus callosotomy and vagus nerve stimulation. He presented with disturbed sensorium and recurrent episodes of subtle stiffening of the left hand. Video EEG revealed frequent right hemispheric EEG seizures with no clear localization. FDG PET/CT was performed with continuous scalp EEG recording. One electrographic seizure was recorded three minutes prior to the injection and five brief electrographic seizures were recorded during scanning. FDG PET/CT revealed multiple areas of increased uptake in the right hemisphere in the frontal and parietal regions corresponding to multiple cortical tubers. Seizures resolved with intravenous midazolam drip and intravenous Phenobarbital.

Conclusions: PET/CT with continuous EEG monitoring is feasible and can provide valuable information in a selected group of children with frequent focal non convulsive seizures.

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INTEGRATING NONLINEAR DECISION FUNCTIONS WITH PRINCIPAL COMPONENT ANALYSIS IN FMRI LANGUAGE ACTIVATION PATTERNS CLASSIFICATION

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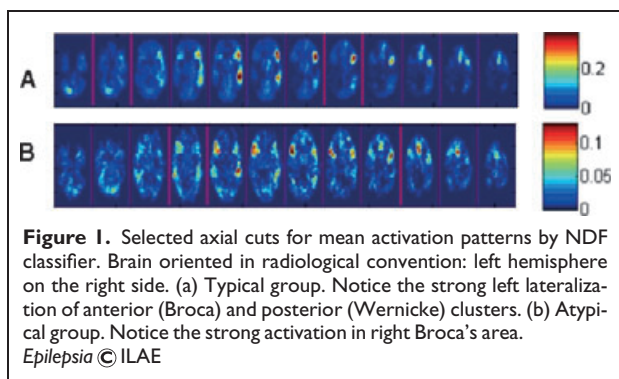
Rationale: This paper describes a pattern classification paradigm using nonlinear decision functions (NDF) as means to automatically categorize language related fMRI brain activation maps into typical and atypical groups within a large heterogeneous population. Data was provided by a multisite consortium dedicated to pediatric epilepsy research involving 13 hospitals.

Methods: NDF under different dimensions and with different degrees of complexity were applied in association with the eigenvectors of the principal component analysis (PCA). 400 synthetic datasets were generated based on real datasets collected from 122 subjects. The well-established support vector machines (SVM) method is also used for comparative purposes.

Results: In the testing phase using synthetic data, high classification results were obtained with an accuracy of 96%, a sensitivity of 97%, a specificity of 95%, and a precision of 95%. These optimal results were obtained with the use of 4 dimensions (eigenvectors) and a degree of complexity of 7. These results are given in Table 1 with SVM included for comparative purposes. Moreover, based on the best NDF classifier,

	Dimension	Best complexity degree	Accuracy	Sensitivity	Specificity	Precision
NDF	1D	8th order	72.00	91.00	53.00	65.94
	2D	7th order	75.50	94.00	57.00	68.61
	3D	4,5,6, or 7th order	86.00	92.00	80.00	82.14
	4D	7th order	96.00	97.00	95.00	95.10
	5D	5,6, or 7th order	95.00	95.00	95.00	95.00
	Dimension	Best Kernel	Accuracy	Sensitivity	Specificity	Precision
SVM	1D	Polynomial 3rd order	78.00	76.92	80.00	76.00
	2D	Polynomial 4th order	82.00	81.00	83.00	82.65
	3D	Polynomial 5th order	90.00	91.00	83.00	84.26
	4D	Polynomial 3rd order	93.50	94.00	93.00	93.07
	5D	Radial Basis Function	91.00	93.00	89.00	89.42

Table 1 for 2.117. NDF and SVM optimal performances with different dimensions & complexity degree for NDF and best kernel for SVM in percentage values



two distinct activation patterns among the 122 real datasets were identified as illustrated in Figure 1. In order to assess the significance of these groupings, the results were compared with those obtained using clinical rating and lateralization index (LI). Good agreements were found for both: 82.79% agreement with LI (Kappa 0.592) and 81.15% agreement with visual rating (Kappa 0.548).

Conclusions: The data-driven mechanism using NDF was found to be effective at classifying typical from atypical language networks activation patterns, even from a heterogeneous population often acquired with different acquisition parameters. The integration of PCA with the NDF classification paradigm results in a data-driven method that is both accurate and computationally appealing (within few seconds in processing time after the weights of the decision function are generated in the training phase). This could promote objective assessments of large data sets and to interrogate data for a multitude of clinical variables.

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HEALTH-RELATED QUALITY OF LIFE IN CHILDREN WITH NEW ONSET EPILEPSY: A LONGITUDINAL ASSESSMENT OF THE FIRST 2 YEARS POST-DIAGNOSIS

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Rationale: The primary goal of epilepsy treatment is to control seizures, but improving health-related quality of life (HRQL) for children with epilepsy and their families is a major component of optimal management. Most previous research is based on relatively small samples, often focusing on selected sub-groups such as adolescents or children with intractable/refractory epilepsy. Occasionally comparisons with other chronic conditions are documented and most studies are cross-sectional, thus providing only a one-time "snap-shot" of outcomes. Little information is available about HRQL at any point in the course of epilepsy in childhood using comprehensive, multidimensional assessment tools. Virtually no information is available on HRQL over time. Our objective is to describe the course of HRQL over the first 2 years post-diagnosis in children four to twelve years of age with new onset epilepsy. We hypothesized that HRQL would be lowest post-diagnosis and at its highest two years later.

Methods: Data are from the Health-Related Quality of Life Study in Children with Epilepsy Study (HERQULES), a national prospective study of children newly diagnosed with epilepsy in Canada. HRQL was assessed using two validated parent-report measures: an epilepsy-specific measure, Quality of Life in Children with Epilepsy Questionnaire

(QOLCE); and a generic measure, Child Health Questionnaire (CHQ) at 4 times: post-diagnosis, and 6, 12, and 24 months later. Linear mixed-models as implemented in SAS software version 9.1 were used to assess changes in mean levels of HRQL between assessments at post-diagnosis and two years later.

Results: Among the 72 pediatric neurologists invited to participate, 53 identified 460 eligible families, 376 (82%) of whom participated. The overall QOLCE mean score as well as CHQ Physical and Psychosocial Summary mean scores were all lowest post-diagnosis (QOLCE Overall mean=68.6, SD=13.3; CHQ Physical mean=48.7, SD=10.8; CHQ Psychosocial mean=44.8, SD=10.8, respectively) and improved to the highest levels observed at the final assessment 24 months later (QOLCE overall mean=72.6, SD=13.3; CHQ Physical mean=51.5, SD=10.0; CHQ Psychosocial mean=48.1, SD=11.2). Linear mixed-effects models indicated that all three HRQL mean scores two years after diagnosis were significantly higher than those observed post-diagnosis ($p < 0.0001$). Amount of change over 2 years for individual domains of HRQL was quite variable with several domains showing large improvement. Trajectories of changes in HRQL across all four times between post-diagnosis and two years will also be described.

Conclusions: HRQL in children ages four to twelve with new-onset epilepsy is compromised initially post-diagnosis and improves significantly over the next two years to levels close to those reported for healthy children. An important next step is to identify patient, family and health care factors affecting these trajectories of HRQL during the first two years after diagnosis.

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INCIDENCE AND OUTCOME OF SEIZURES IN LONG-TERM SURVIVORS OF PEDIATRIC BRAIN TUMORS

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Rationale: Although only a minority of children with epilepsy have an underlying central nervous system neoplasm, seizures are common during and after treatment for a primary brain tumor. Risk factors that predispose patients to develop seizures and which define the subpopulation of patients who will develop medically refractory seizure disorders is poorly defined. The objectives of our study were to describe the incidence of seizures in the population of long-term survivors of pediatric brain tumors and to determine risk factors for poor seizure control.

Methods: In a retrospective, cross-sectional study, we reviewed the clinical data for all patients presenting for follow-up evaluation during a 12-month period who were at least two years after initial diagnosis of a central nervous system tumor. Clinical data collected included patient demographics, age at diagnosis, length of follow-up, extent of initial resection, tumor histology, and treatment modalities were obtained. For patients who had experienced seizures at any time from initial presentation to the most recent follow-up visit, timing and frequency of seizures. Statistics were calculated with SPSS using chi-square test.

Results: The patient cohort in the long-term survivor clinic included a total of 298 patients (140 females). Average duration of follow up after initial diagnosis was 7.6 years. Initial surgical resection was gross-total in 110 patients, and subtotal for 143. 30 patients underwent biopsy alone and 16 had no surgical intervention. Tumor localization included posterior fossa (104; 35%), midline (98; 33%), cortical (85; 28%) and other locations (11; 4%). Most frequent tumor pathologies included low grade gliomas (including glial-neuronal tumors and oligodendroglioma), medulloblastoma and ependymoma. 155 patients received radiotherapy and 128 patients underwent chemotherapy (86 patients received both, 29%). Recurrent tumors were seen in 91 patients (30%). Seizures were experienced in 72 patients (24%). Ongoing seizures at the time of most recent follow-up were present in 42 patients (58% of patients with seizures; 14% of cohort). Risk factors for seizures at any time from presentation to last follow-up included tumor location (cortical), tumor histology (glial or glial-neuronal), tumor recurrence and incomplete resection at time of initial presentation. Cortical location, recurrence of tumor and