TNF-α and IFN-γ level are not significantly different between febrile seizure patients and controls.

Conclusions: Present results support that proinflammatory cytokine, IL-6, is activated and could have a role in the pathogenesis of febrile seizures.

2.114
SEIZURE EXACERBATION AFTER INITIATION OF LEVETIRACETAM IN CHILDREN

Dana Marafie[1,2], R. Das[2], A. Datta[2], J. Lipton[2], K. P. Maski[2] and M. Takeoka[2]

[1]Faculty of Medicine - Kuwait University, Jabriya, Kuwait and [2]Epilepsy, Children's Hospital, Boston, MA

Rationale: Paradoxical reactions including exacerbation of seizures have been reported for a number of anti epileptic drugs (AED). Levetiracetam (LEV) is a widely used newer anti epileptic medication with a favorable pharmacokinetic profile and few adverse effects. Only one prior study has reported exacerbation of seizures by LEV. In this study we present data on significant exacerbation of seizures by LEV.

Methods: We retrospectively reviewed medical records of all children with epilepsy and LEV related seizure exacerbation (n=6), who had their care for epilepsy at Children's Hospital Boston. The study was approved by the institutional review board at Children's Hospital Boston. Clinical information was reviewed including response to LEV with increase in seizures. Baseline seizure frequency was measured up to 6 months prior to exacerbation.

Results: Mean age was 4.8 years (range (years): 1.2-14.11). The most common seizure etiology was complex partial seizures(Table 1). Mean LEV dosage was 106.4 mg/kg/day (range: 25.2-232 mg/kg/day). Complex partial seizures were exacerbated in three patients, generalized and myoclonic seizures in one each. Two patients experienced a new type of seizure. All children had an at least two fold increase in seizure frequency (Table 2).

Conclusions: This study demonstrated dramatic increase (at least two fold) in seizures within 1 month of LEV initiation, which was reversed with discontinuation of LEV. Such a marked exacerbation of seizures has not been previously reported with LEV. Seizure exacerbation was not clearly associated with seizure etiology. Although LEV is a safe and effective AED, it is important to understand that seizure exacerbation may occur, especially at higher doses.

2.115
FUNCTIONAL MAGNETIC RESONANCE IMAGING GROUP DECISION MAKING BASED ON BRAIN ASYMMETRY

Magno R. Guillen[1], M. Adjouadi[1], B. Bernal[3], X. You[1], A. Barreto[1], N. Rishe[2], P. Jayakar[3] and W. D. Gaillard[4]

[1]Electrical and computing Engineering, Florida International Univeristy, Miami, FL; [2]Computer Science, Florida International University, Miami, FL; [3]Brain Institute, Miami Children's Hospital, Miami, FL and [4]Department of Neurology and Pediatrics, Children's National Medical Center, Washington, DC

Rationale: This research presents a novel approach for Lateralization Index (LI) calculation in support of a decision making process for the classification of subjects based on their brain activation patterns using functional magnetic resonance imaging (fMRI) datasets. The decision process considers the subject grouping based on a novel LI computational method using sub-sampling of the analyzed brain area, and the respective behavior for each individual when masking for specific Broca-Wernicke language areas.

Patient	Age (years and months)	Gender	Etiology	Developmentally Delayed	Predominant Seizure Type	EEG	MRI
1	1 y 2 m	Male	Idiopathic vs cryptogenic	Yes	Complex partial	Scattered sharp waves	Normal
2	12y 4m	Female	Idiopathic	Yes	Myoclonic seizures	Generalized sharp slow wave complexes	Normal
3	14y 11m	Female	Idiopathic	No	Generalized tonic clonic seizures	Right centrotemporal and parietal spikes	Mild asymmetry, temporal horns
4	3y 9m	Female	Cortical dysplasia	Yes	Complex partial seizures	Left temporal sharp waves	Normal
5	8y 10m	Male	Landau- Kleffner syndrome, refractory	Yes	Complex partial seizures	Bilateral frontotemporal and central spikes	Normal
6	3y 11m	Female	Sturge- Weber Syndrome, bilateral	Yes	Complex partial seizures	Left posterior quadrant seizures	Bilateral Sturge- Weber Syndrome

Table 1. Demographic Information and Baseline Clinical Data

Patient	Other AEDs	Maximum LEV dose (mg/kg/day)	Seizure frequency before LEV introduction	Fold increase of seizures during LEV therapy
1	Phenobarbital	74.38	4/month	75 fold
2	Valproic Acid	25.2	5-10/ day	2 fold
3	None	42.7	3 lifetime seizures	108 fold
4	Oxcarbazapine	232	4-6/ day	7 fold
5	Diazepam	82.4	Rare	2 fold
6	Phenobarbital	80.3	Rare but history of status	20 fold

Table 2. Clinical Features

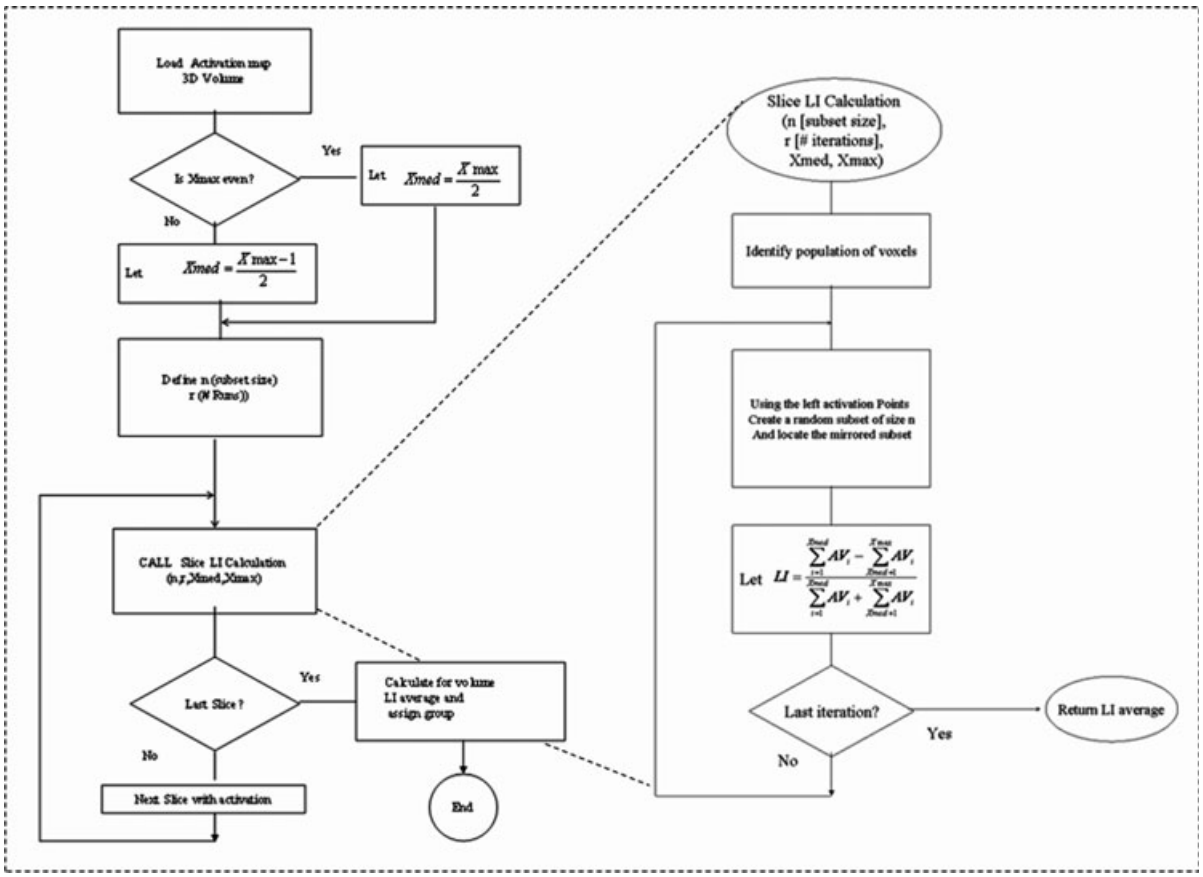

Figure 1. Structure for the LI-based Algorithm
Epilepsia © ILAE

Methods: 114 de-identified fMRI datasets, obtained during the execution of the language oriented paradigm referred as ''auditory description decision task'' (ADDT), were analyzed using the FSL (FMRIB software library). The data was obtained from 5 different hospitals using the online web-based repository (mri-cate.fiu.edu). All the images were Z (Gaussianised T/F) statistic images thresholded by Z>2.3 and a (corrected) cluster significance of P=0.05. Masks were used for Broca's and Wernicke's language areas using a normal brain, and masks were used for each of the 48 Brodmann areas (BA). The algorithm, as structured in Figure 1, was implemented in MATLAB. The decision for subject classification is made based on the range of the LI obtained: strong lateralized ($|LI| \geq 0.5$), lateralized ($0.2 \geq |AI| < 0.5$) and bilateral ($|LI| < 0.2$).

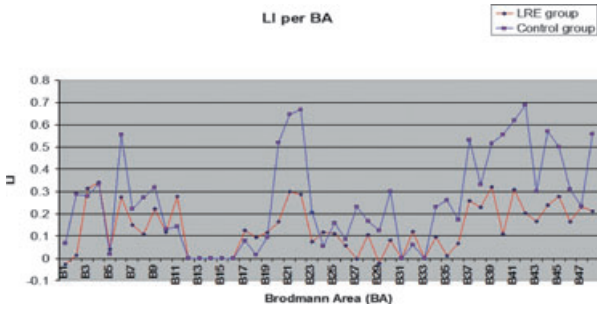

Figure 2. Average LI per BA contrasting LRE and control groups
Epilepsia © ILAE

Results: Activation maps were obtained on 103 (90%) and no activation on 11 (10%) of the population; from the 103 subjects, 64 were control subjects and 39 were location- related epilepsy (LRE) subjects. Analyzing the LI, computed from control and LRE (c%, e%) datasets, five groups were identified: 1) strong right lateralization: (0%, 18%), 2) right lateralization: (0%, 10%), 3) bilateral: (14%, 10%), 4) left lateralization: (19%, 5%), and 5) strong left lateralization: (67%, 56%).

Conclusions: None of the control data displayed right activation as opposed to 28% on the epilepsy data, since this area is not a typical language area this finding may lead us to believe on a potential language network re-localization. It is also noted that subjects with epilepsy exhibit a lower LI as shown in Figure 2.

2.116
UTILITY OF ICTAL PET/CT IN THE MANAGEMENT OF NON CONVULSIVE FOCAL STATUS EPILEPSTICUS

Marlene A. Blackman[1], I. Mohamed[1], s. Kozlik[1], C. P. Molnar[2] and S. Wiebe[2]
[1]Neurosciences, Alberta Childrens Hospital, Calgary, AB, Canada and [2]Neurosciences, Foothills Hspital, Calgary, AB, Canada

Rationale: Interictal positron emission tomography (PET) using [^{18}F] flourodeoxyglucose (FDG) is commonly used to identify the epileptogenic zone in patients with drug-resistant partial epilepsy. The development of PET/CT has decreased scan time and improved anatomic

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: [^{18}F] 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, Isoflourane 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.

2.117
INTEGRATING NONLINEAR DECISION FUNCTIONS WITH PRINCIPAL COMPONENT ANALYSIS IN FMRI LANGUAGE ACTIVATION PATTERNS CLASSIFICATION

M. Adjouadi[1], Xiaozhen You[1], M. Guillen[1], M. Ayala[1], M. Cabrerizo[1], P. Jayakar[7], A. Barreto[1], N. Rishe[1], J. Sullivan[2], D. Dlugos[2], M. Berl[8], J. VanMeter[3], D. Morris[4], E. Donner[4], B. Bjornson[6], M. Smith[5,8], B. Bernal[7] and W. D. Gaillard[3,8]

[1]College of Engineering and Computing, Florida International University, Miami, FL; [2]Children's Hospital of Philadelphia, Philadelphia, PA; [3]Department of Neurology, Georgetown University, Washington, DC; [4]Hospital for Sick Children, Toronto, ON, Canada; [5]Department of Psychology, University of Toronto, Toronto, ON, Canada; [6]BC Children's Hospital, Vancouver, BC, Canada; [7]Brain Institute, Miami Children's Hospital, Miami, FL and [8]Department of Neurosciences, Children's National Medical Center, Washington, DC

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

doi: 10.1111/j.1528-1167.2009.02377.x

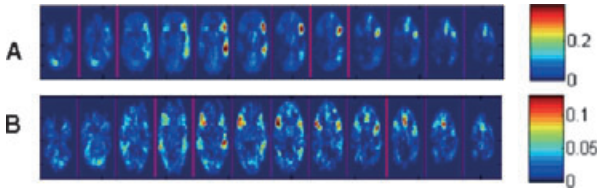

Figure 1. Selected axial cuts for mean activation patterns by NDF classifier. Brain oriented in radiological convention: left hemisphere on the right side. (a) Typical group. Notice the strong left lateralization of anterior (Broca) and posterior (Wernicke) clusters. (b) Atypical group. Notice the strong activation in right Broca's area.

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.

2.118
HEALTH-RELATED QUALITY OF LIFE IN CHILDREN WITH NEW ONSET EPILEPSY: A LONGITUDINAL ASSESSMENT OF THE FIRST 2 YEARS POST-DIAGNOSIS

Kathy N. Speechley[1,6], C. Camfield[2], S. Levin[1,6], M. L. Smith[3], S. Wiebe[4] and G. Y. Zou[5]
[1]Paediatrics, University of Western Ontario, London, ON, Canada; [2]Paediatrics, Dalhousie University, Halifax, NS, Canada; [3]Psychology, University of Toronto, Toronto, ON, Canada; [4]Clinical Neurosciences, University of Calgary, Calgary, AB, Canada; [5]Epidemiology & Biostatistics, University of Western Ontario, London, ON, Canada and [6]Children's Health Research Institute, London, ON, Canada

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.

2.119
INCIDENCE AND OUTCOME OF SEIZURES IN LONG-TERM SURVIVORS OF PEDIATRIC BRAIN TUMORS

Nicole J. Ullrich, S. L. Pomeroy and T. Loddenkemper
Neurology, Children's Hospital Boston, Boston, MA

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 in110 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