The localizing value of SISCOM in Intractable Pediatric Epilepsy and Tuberous Sclerosis

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RATIONALE

To analyze the results of our experience in the utilization of SISCOM (Subtraction Ictal SPECT coregistered on MRI) in evaluation and outcome in pediatric patients with Tuberous Sclerosis and medically intractable epilepsy.

METHODS

11 patients underwent Ictal SPECT as part of their presurgical evaluation between 2004 and 2006. The study utilized Neurolyte® with 20 mCi dosing calibrated twice per day and usually administered within 30 seconds of electrical seizure onset. A follow up interictal SPECT study was completed, subtracted and superimposed on volumetric 1.5TMRI utilizing the Analyze software (SISCOM). Hyperperfusion and Hypoperfusion coregistrations were obtained. The data was analyzed in conjunction with standard digital Video-EEG, state of the art anatomic MRI and neuropsychological data for selection of surgical candidates. EEG and SISCOM data were considered localizing when one side/one region or one side/2 contiguous regions were active. All others were considered not lateralizing or localizing.

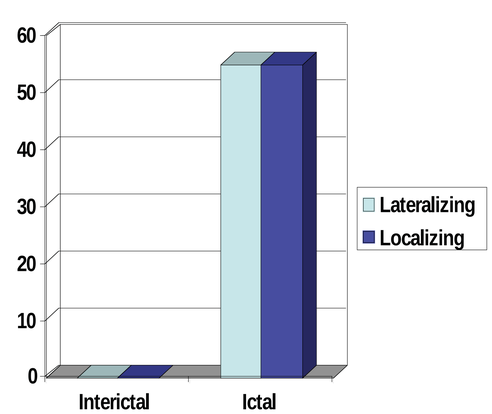
RESULTS

Patients range in age from 15 months to 21 years. Only patients (9/11) with localizing SISCOM results were included in the analysis. MRI studies were abnormal in all of patients and showed the typical findings of Tuberous Sclerosis. Particular attention was placed on size and location of the cortical tubers. Interictal EEG was non-lateralizing or localizing in 100% of patients. Ictal EEG was non-lateralizing or localizing in 45%, and lateralizing or localizing in 55% of the patients. When the ictal and interictal SPECT studies were coregistered, SISCOM hyperperfusion/hypoperfusion studies were evaluated in the context of all the available presurgical information and used for decisions regarding need and placement of intracranial recording and resections. SISCOM data offered unifocal hyperperfusion in 88 % of patients and hypoperfusion SISCOM offered localization in only one (11%) of the patients. Five patients with localized ictal EEG and unifocal hyperperfusion studies underwent surgical resection, 4 of them with implantation of subdural electrodes. Of them, 80% are at Engel I-II (free of disabling seizures or rare disabling seizures). The congruency of the data was very helpful in the surgical planning. Three patients with non-localized ictal EEG and unifocal hyperpefusion studies underwent surgical resection, two with intracranial subdural electrode recordings completed. Of them, one is at Engel II, and two are at Engel III (worthwhile improvement). Overall, only one patient has not had worthwhile improvement. Seven of nine patients had intracranial recordings. Decision for subdural electrode placement was greatly helped by the data from SISCOM studies. Overall the concordance between SISCOM and EEG lateralization/localization was significant. There was a higher statistical significant correlation between hyperperfusion SISCOM images and MRI with focal abnormalities

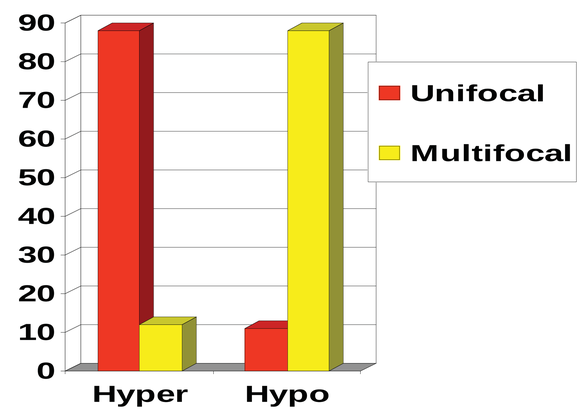
CONCLUSIONS

In pediatric patients with Tuberous Sclerosis complex and intractable epilepsy, SISCOM is a very helpful test in localization of the epileptogenic zone. Hyperperfusion SISCOM localizes more frequently than other techniques. Statistically significant correlation occurred between ictal EEG, hyperpefusion SISCOM, and focal MRI abnormalities. The results are particularly helpful in patient surgical selection and electrode coverage for intracranial recordings. Patient outcome was favorable.

DISCUSSION



EEG



SISCOM

5/11 patients with localized ictal EEG and unifocal hyperperfusion had surgery. Engel* I-II: 80%

3/11 patients with non-localized ictal EEG and unifocal hyperpefusion had surgery. Engel II: 33% Engel III: 66%

*Engel I: Free of disabling seizures Engel II: Rare disabling seizures, "almost seizure free" Engel III: Worthwhile improvement Engel IV: No worthwhile improvement