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2 year Follow-up of Childhood Moyamoya after Encephalo-Duro-Arterio-Myo-Synangiosis (EDAMS): Evaluation with Acetazolamide Brain SPECT (Acz-SPECT) and MR Angiography (MRA)

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PURPOSE: Longterm F/U evaluation of cerebrovascular hemodynamic changes after EDAMS is important because childhood moyamoya disease has a progressive nature and EDAMS is an indirect revascularization method. We evaluated cerebro-vascular hemodynamic changes of moyamoya pts during 2 yr after EDAMS with Acz-SPECT and correlated with MRA finding. **METHODS:** 23 operated cerebral hemispheres of the 21 childhood moyamoya pts (M/F:10/11, mean age 8 ±3 yrs) were evaluated with Acz-SPECT using ^{99m}Tc-ECD and MRA within 1 mo before, 1 yr (6 ±3mo) and 2 yr (21 ±7mo) after EDAMS. 10 pts also underwent frontal encephalo-galeo-synangiosis. Regional cerebral blood flow (rCBF) and cerebrovascular reserve (rCVR) of 8 cortical regions in each hemisphere [2 anterior cerebral artery (ACA), 4 mid-cerebral artery (MCA), and 2 posterior cerebral artery (PCA) territories] were scored as 5 grade scale (0=perfusion defect to 4=normal). Perfusion index (PI) was defined as the sum scores of rCBF and rCVR in each territory. Arterial stenosis and transdural collaterals were also evaluated. The changes of PIs in each territory and the changes of cerebral arterial stenosis with collateral formation at 1 and 2 yr F/U were correlated. **RESULTS:** Pre-operative stages of moyamoya disease were Suzuki type 1 in 1, 2 in 6, 3 in 7, and 4 in 9 cases. Mean PIs of each territory were summarized in the table. PIs of operated (MCA & ACA) territories were improved in 14, unchanged in 7, and aggravated in 2 cases at 1 yr F/U. PIs of PCA territory were improved in 4, unchanged in 16, and aggravated in 3 cases. At 2 yr F/U, PIs of operated territories were unchanged in 10 and improved in 12 cases including 2 with aggravation and 5 with no change at 1 yr F/U, but newly aggravated in 2 cases. PIs of PCA territory were improved in 5 or unchanged in 15, but further or newly aggravated in 3 cases. The arterial stenosis was progressed in 9 cases (5 MCA, 3 PCA, and/or 3 ACA). In these cases, PIs were aggravated in 3 (2 operated and/or 2 PCA territories) with poor collateral formation, unchanged in 2, and improved in 4 cases during 2 yr F/U. **CONCLUSION:** Cerebral perfusion of MCA and ACA territories progressively improved during 2 yr F/U, even in cases aggravated or not improved at 1 yr after EDAMS. *p<0.05 (preop. vs 1 yr), †p<0.05 (1 yr vs 2 yr), ‡not significant

	Preop.	1 yr F/U	2 yrs F/U
PI of ACA & MCA (0-48)	35.3±6	38.5±7*	40.4±8†
PI of PCA (0-16)	12.7±3	12.8±3‡	12.6±4‡

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Evaluation of Seizure Propagation on Ictal Brain SPECT Using Statistical Parametric Mapping in Temporal Lobe Epilepsy

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Ictal brain SPECT has a high diagnostic sensitivity exceeding 90 % in the localization of seizure focus, however, it often shows increased uptake within the extratemporal areas due to early propagation of seizure discharge. This study aimed to evaluate seizure propagation on ictal brain SPECT in patients with temporal lobe epilepsy (TLE) by statistical parametric mapping (SPM). **Methods:** Twenty-one patients (age 27.14 5.79 y) with temporal lobe epilepsy (right in 8, left in 13) who had successful seizure outcome after surgery and nine normal control were included. The data of ictal and interictal brain SPECT of the patients and baseline SPECT of normal control group were analyzed using automatic image registration and SPM96 softwares. The statistical analysis was performed to compare the mean SPECT image of normal group with individual ictal SPECT, and each mean image of the interictal groups of the right or left TLE with individual ictal scans. The t statistic SPM{t} was transformed to SPM{Z} with a threshold of 1.64. The statistical results were displayed and rendered on the reference 3 dimensional MRI images with p value of 0.05 and uncorrected extent threshold p value of 0.5 for SPM{Z}. **Results:** SPM data demonstrated increased uptake within the epileptic lesion in 19 patients (90.4 %), among them, localized increased uptake confined to the epileptogenic lesion was seen in only 4 (19%) but 15 patients (71.4%) showed hyperperfusion within propagation sites. Bi-temporal hyperperfusion was observed in 11 out of 19 patients (57.9%, 5 in the right and 6 in the left); higher uptake within the lesion than contralateral side in 9, similar activity in 1 and higher uptake within contralateral lobe in one. Extra-temporal hyperperfusion was observed in 8 (2 in the right, 3 in the left, 3 in bilateral); unilateral hyperperfusion within the epileptogenic temporal lobe and extra-temporal area in 4, bi-temporal with extra-temporal hyperperfusion in remaining 4. **Conclusion:** Ictal brain SPECT is highly sensitive in the localization of epilepogenic lesion, however, increased uptake within remote areas from the seizure onset zone also can be seen due to seizure propagation. Interpretation of ictal images combined with the analysis of ictal EEG patterns of propagation is important to avoid false lateralization