

Language reorganization following anterior temporal lobectomy in patients with chronic intractable epilepsy

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Introduction: Language functioning might be affected in patients with chronic intractable epilepsy especially in left hemisphere^{1,2}. Functional MRI was used to study the cortical language network in patients of left temporal lobe epilepsy (TLE) prior to and after the anterior temporal lobectomy (ATL).

Method: After obtaining the institute ethics approval, six consecutive patients with left temporal lobe epilepsy were recruited in this study (Table 1). All six patients underwent left ATL. Standard diagnostic and exclusion criteria were followed. Language paradigm included task: Naming (simple Hindi words which patients read out), Decision making (choose synonym or antonym of the noun using response pad), Syntactic (simple Hindi sentences to be read orally, and Syntactic-semantic (jumbled sentences which to un-jumble & read orally). The study design involved a standardized paradigm with active phase of above mentioned four events and alternating black-white screen during baseline phase. Functional MRI using 1.5T MR scanner (Avanto, Siemens, Germany) with 12-channel head coil was performed on patients as prior to surgery and after six month of surgery. Group pre and post surgery follow up correlation analysis was performed in SPM 8. The stimuli were presented using a MR compatible audio visual stimulus system with binocular goggles (Nordic Neuro Lab, Norway). The patient had to give response by push button pad (4-key, Lumina LP 400, Cedrus Inc, USA) and verbal output was recorded by microphone. Single-shot echo planar imaging (EPI) sequence was used for the BOLD studies (number of slices: 29, slice thickness 4.5 mm; TR: 2000 ms, TE: 24 ms, FOV: 100 mm, resolution: 64x64 and total number of measurements: 256).

Results: BOLD activation (Figure 1) was observed in Wernicke's area (BA 21, 22) in right hemisphere in Pre-surgery LTLE group with respect to Post-surgery LTLE group. However after 6 months of surgery follow up, patients group recruited left superior temporal gyrus during simple semantic task. During semantic decision making task, patients recruited left inferior frontal gyrus (BA 47) whether post surgery follow up they showed activation in right STG (BA 21 22). Post-surgery, activation was observed in left superior temporal gyrus (BA 21, 22), left post central gyrus (BA 2, 3), left superior parietal lobule (BA 5, 7), left insula (BA 13), right fusiform gyrus (BA 37) & right middle frontal gyrus (BA 6) during increasing complexity of sentences task (in comparison to Presurgery LTLE group).

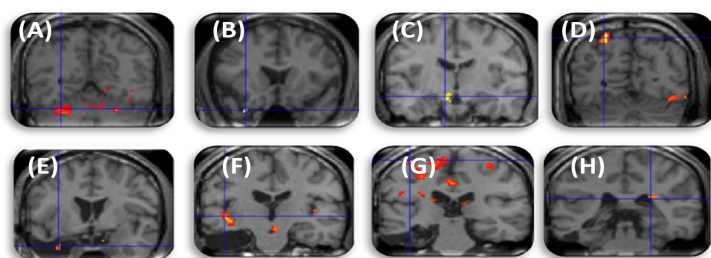


Figure 1. BOLD activation during (A,E) Simple noun naming task (B,F), Semantic decision task (C,G), Syntax task (D,H) and Jumbled sentence task in presurgery (A,B,C,D) and post-surgery (E,F,G,H) in left TLE patients

Table 1. Demographic details

Patient age at recruitment (mean \pm SD) years	Gender	Diagnosis	Surgery
25.00 \pm 3.90	2M/4F	LMTS	ATLR

Discussion: LTLE patients group showed absence of left temporal lobe activation suggesting deficits in these patients during simple semantic task. However the recruitment of left superior temporal gyrus after anterior temporal lobe resection suggest naming (simple semantic task) might be reorganised in LTLE patients. Increasing language complexity invoked activation in left temporal cortex indicating that Wernicke's area along with left post central gyrus (BA 2, 3), left superior parietal lobule (BA 5, 7), left insula (BA 13), right fusiform gyrus (BA 37), right middle frontal gyrus (BA 6) may still be intact for higher language functions, after ATLR. This suggests that components of language get reorganised after surgery, similar to earlier studies^{1,2}.

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