

Language

Aphasia with anatomical isolation of the language area: A reanalysis on the light of modern neuroimaging techniques

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Introduction: Goldstein (1948) and Geschwind (1968), based in data derived from anatomical post-mortem studies, postulated that the disconnection of the perisylvian language areas (PSLA) from other cortical areas was responsible for impairments in spontaneous speech and language comprehension with preservation of verbal repetition and echolalia (isolation of speech area). Nevertheless, other mechanisms (right hemisphere or bilateral hypotheses) underlying echolalic repetition have been proposed. Herein, we examined the structure and function of the PSLAs in two cases of aphasia with echolalic repetition and isolation of the left PSLA.

Methods: Two patients with chronic post-stroke aphasia associated to isolation of the left PSLA were studied. Both patients underwent cognitive-language assessment and multimodal imaging. In patient 1 (p1), structural MRI, diffusion tensor imaging (DTI), functional MRI (fMRI) during repetition of words and non-words, resting state fMRI (rsfMRI) were acquired, whereas only structural MRI was performed in patient 2 (p2). The Tractotron software was used to examine the severity of disconnection in each language-related white matter tract in both patients. We quantified the severity of the disconnection by measuring the proportion of each tract that was affected. 18FDG-PET was also acquired in both patients.

Results: P1 had a mixed transcortical aphasia and p2 had a transcortical sensory/anomic aphasia. In both, the MRI showed separate left anterior and posterior lesions with relative preservation of the PSLA. In both, 18FDG-PET revealed significant decrements of metabolic activity in areas of the left PSLA, although some parts showed normal metabolic activity. In p1 the left arcuate fasciculus (AF) and the inferior fronto-occipital fasciculi (IFOF) could not be reconstructed. fMRI showed perilesional activity in the left hemisphere and increased activity in the right during word repetition. rsfMRI showed compensatory activity in both hemispheres (right greater than left). Analysis with the Tractotron software revealed disconnection of both the AF and the IFOF in the left hemisphere of both patients.

Discussion: Although some parts of the left PSLA had preserved metabolic activity in both patients, our neuroimaging data revealed that preserved repetition ability did not rely exclusively on the residual activity of the left PSLA. In support, the connectivity between different components of the left PSLA was severely affected. This coupled with the increased metabolic activity of the right PSLA supports the bilateral hypothesis of residual repetition in transcortical aphasias.

References: Goldstein, K. (1948). *Language and Language Disturbances*.
Geschwind, et al. (1968). *Neuropsychologia* 6, 327–340.

Keywords: Language; patients; single case study; adults; cerebrovascular; behavioural, lesion mapping.

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