فقدان القدرة على النطق فى مرضى السكتة الدماغية: دور التصوير الوظيفى بالرنين المغناطيسى فى تقييم استعادة الوظيفة

بحث
مقدم من

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Aphasia in stroke patients: Role of functional magnetic resonance imaging (fMRI) in assessment of recovery

A thesis submitted for partial fulfillment of M.D. degree in radiodiagnosis

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LIST OF ABBREVIATIONS

ACA	: anterior cerebral artery
ASL	: American Sign Language
AVM	: arteriovenous malformation
BOLD	: blood-oxygen-level-dependent
CBF	: cerebral blood flow
CBV	: cerebral blood volume
CMRO2	: cerebral blood oxygen consumption
CNR	: Contrast to Noise Ratio
CVA	: cerebrovascular accidents
DeoxyHb	: deoxy hemoglobin
DSA	: digital subtraction angiogram
DWI	: Diffusion weighted images
ECS	: electrocortical stimulation
EEG	: electro-encephalography
EHI	: Edinburgh Handedness Inventory
EPI	: echo-planar imaging
FAS	: Foreign Accent Syndrome
fcMR	: functional connectivity MR imaging
fig.	: figure
fMRI	: functional magnetic resonace imaging
FOV	: field of view
HG	: Heschl's gyrus
IOSs	: intrinsic optical signals
LI	: laterality index
LQ	: laterality quotient
MCA	: Middle cerebral Artery
MEG	: magneto-encephalography
MNI	: Montreal Neurological Institute
MR	: magnetic resonace
MRI	: magnetic resonace imaging
MTA	: Mixed Transcortical Aphasia
NO	: nitric oxide
PCA	: posterior cerebral artery

PET : positron emission tomography
PI : Parallel imaging
PT : planum temporale
RF : radiofrequency
ROIs : regions of interests
RTMS : Repetitive TMS
SIM : signal intensity maps
SLT : speech and language therapy
SMA : supplementary motor area
SNR : signal-to-noise ratio
SPM2 : Statistical Parametric Mapping version 2
T : Tesla
TCM : Transcortical Motor
TCS : Transcortical sensory
TDCS : Transcranial direct current stimulation
TE : Echo Time
TMS : Transcranial magnetic stimulation
TR : Repetition Time

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I-INTRODUCTION:

Stroke is a major cause of disability in adults. Aphasia is observed with a frequency ranging from 21% to 38% at the acute stage. ***(Godefroy et al.; 2002)***

Intensive rehabilitation interventions are being used more commonly as delivery of post-stroke care improves and can reduce long-term disability. ***(Johansen-Berg et al.; 2002)***

Patients with aphasia following damage to the language zones of the brain, due to traumatic or vascular lesions, undergo some degree of recovery over time. ***(Musso et al.; 1999)***

Recovery from vascular aphasia implies functional reorganization of the language system in the brain. (***Fernandez et al.; 2004)***

Functional magnetic resonance imaging (fMRI) provides a mechanism for non invasive investigation of brain function. It combines detailed anatomical information with physiological information to create a structural and functional model of a person's brain. ***(Jones et al.; 1998)(Krings et al.; 2001)***

Owing to its noninvasive nature, fMRI which uses blood oxygen level-dependent (BOLD) imaging has been used extensively in all facets of human brain mapping and holds great potential for evaluation of cerebrovascular disease. ***(Carusone et al.; 2002)***

fMRI offers a promising, objective approach for specifically identifying changes in brain activity potentially responsible for recovery of function after stroke ***(Johansen-Berg et al.; 2002)***

fMRI is a relatively new and effective method for the study of language processing. ***(Pillai et al.; 2004)***

AIM OF THE WORK

The aim of this study is to evaluate the role of functional magnetic resonance imaging (fMRI) in the assessment of recovery of aphasia in stroke patients.

ANATOMY

Anatomy of language areas

There has been considerable difference of opinion concerning the status of cortical language areas, and objection has been made to calling them "centers," for they do not represent histologically circumscribed structures of constant function. Moreover, a competent neuroanatomist would not be able to distinguish the cortical language areas microscopically from the cerebral cortex that surrounds them. ***(Ropper and Brown; 2005)***

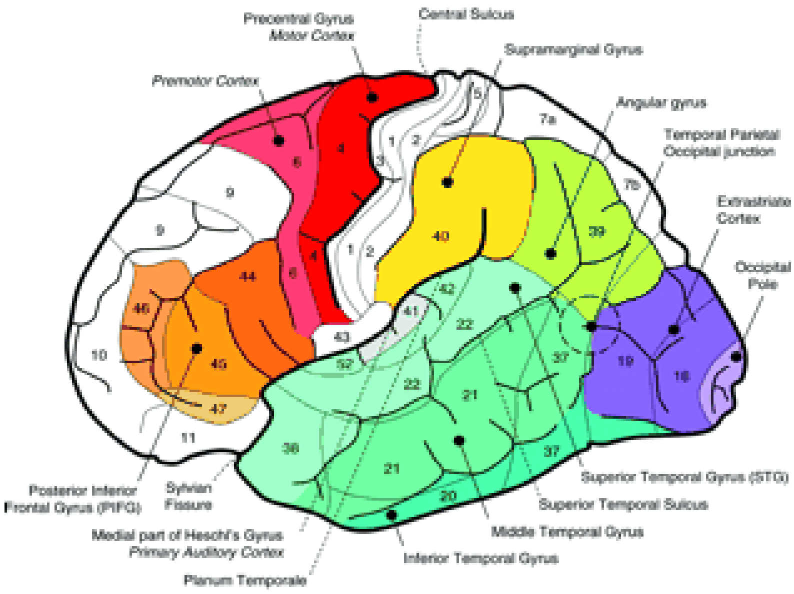

Fig. 1: Main brain regions involved in language processing. Lateral view of the left hemisphere of the human brain. Numbers indicate Brodmann's areas (BA) separated by dotted lines. ***(Démonet, Thierry and Cardebat; 2005)***

The classic model of language processing:

The classic model of language processing (Fig 2) consists of a frontal expressive or motor area (Broca area), a posterior receptive language center (Wernicke area), and a white matter fiber tract (arcuate fasciculus) interconnecting the two. This model originated from lesion studies that correlated neuropathologic brain changes with different kinds of language disorders. ***(Naidich et al.; 2001)***

Broca's area processes the information rePeived from Wernicke's area into a detailed and coordinated pattern for vocalization and then projects the pattern via a speech articulation area in the insula to the motor cortex, which initiates the appropriate movements of the lips, tongue, and larynx to produce speech. ***(Ganong, 2005)***

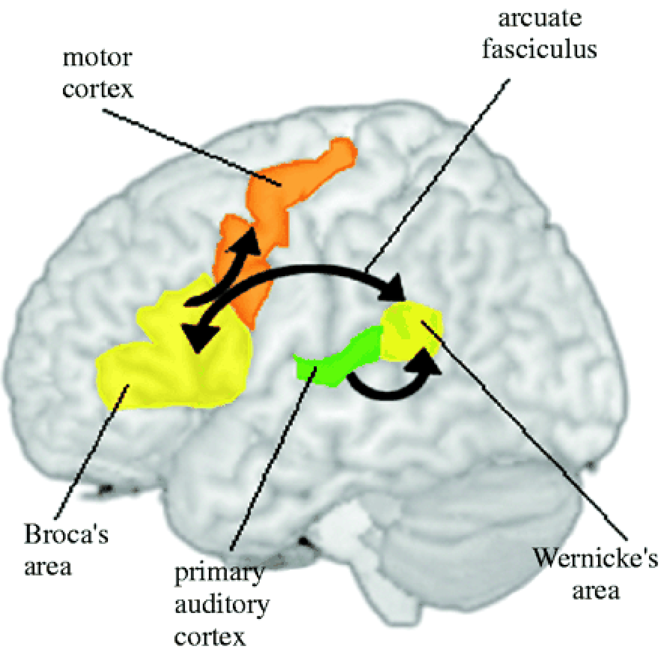

Fig. 2: Classical model of the language system. ***(Tyler and Marslen-Wilson; 2008)***

<u>Broca’s area:</u>

Broca’s area is classically located in the pars opercularis and the posterior portion of the pars triangularis