

Introduction

Growing brain tumor can affect the connection between Broca’s area and motor cortex that result in dysphasia for 30-50% of brain tumor patients. During language mapping with the object-naming task the preexisting dysphasia complicates distinction between the naming errors, phonological errors, speech arrest episodes - as the indicators of language positive regions and slurred speech, delay in answering - as indicators of language negative brain regions. Such unclear responses can affect determination the safe margins of tumor resection.

Evaluation of language function usually is performed by using various test systems (Boston aphasia examination, Halstead screening test, Western Aphasia Battery, etc.) that take a lot of time. Their results difficult to use for distinguishing: speech arrest, delay in answering and slurred speech episodes during language mapping.

The development of criteria for assessment of effect of eloquently located tumors on the connections between Broca’s area and motor cortex could be the solution of this problem for language function.

Methods: retrospective comparative analysis of language status reports, fMRI and DTI for eloquently located brain tumors was performed. Prospective modeling has shown the necessity of further establishing of correlation between following data: intralesional, perilesional, contralesional patterns of fMRI activations, degree of deflection and infiltration of white matter tracts (SLF II, III, AF, FAT) within language area detected by DTI-FT and dynamics of dysphasia.

Results: integrated functional assessment of brain plasticity can evaluate the adaptive capacity of language motor function to growing brain tumor and can serve as reference value for further assessing unclear patient’s response during object-naming task at language mapping.

Assessment functional status of brain plasticity for language motor function

Features	Scale response	Scale notifications
Language status	Sever dysphasia	0
	Mild dysphasia	1
	No dysphasia	2
fMRI: patterns of activation for Broca’s area	Intra-lesion	0
	Per-lesion	1
	Contra-lesion	2
	Contra-lesion + SMA	3
DTI-FT: SLF II, SLF III, AF, FAT (each assessed separately)	Did not affected by tumor	3
	Deflection (degree)	2
	Oedema	1
	Infiltration / Destruction	0

Based on the scale the interpretaions of unclear patient's response during language mapping

Scores 3 and below as the indicators of functional status deterioration for the language motor system		Scores 4 to 7 as the indicators for compensated functional status of the language motor system	
Positive brain language region	Categories of naming errors	Variants of speech behavior for patients with dysphasia	Negative brain language region
	phonological errors	slurred speech, accent	
	speech arrest	delay in answering	
	performance errors, hesitation	slowing speech	

Conclusions

correlation between functional neuroimaging parameters of growing tumor within motor speech area and language status can serve as the objective criteria for assessment of brain plasticity as well as for standardized measurement of response delays during language mapping.

Learning Objectives

By the conclusion of this session, participants should be able to:

- 1) Describe the importance of establishing correlation between fMRI, DTI and language status evaluation in tumors within motor speech area for pre-op functional assessment of brain plasticity and extent of tumor resection.
- 2) Discuss, in small groups the ways of integration of neuroimaging criteria for assessment of the effect of tumor growth on the connections between Broca’s area and motor cortex with language status examination.
- 3) Identify an effective treatment of patients with brain tumors within motor speech eloquent area in the cases of preexisting dysphasia.

References

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