

Modification and extension of language tests performed during intraoperative electrical stimulation and pre-operative brain mapping methods

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Neurosurgical procedures for epilepsy and tumors frequently cause risk to post-operative language function. Although the outcomes related to preservation of language after surgeries guided by Intraoperative Electrical Stimulation (IES) are quite positive, it is suggested that language tests ought to be modified and expanded in order to achieve a better post-operative preservation of language. The objective of the study is to: (1) Introduce an additional set of grammar-focused language tests. Typically, the patient performs the task of naming pictures and counting. However, lexical search and automatised sequences of ensuing numbers do not account for grammatical structures of the patient's language, including syntax. Grammatical tests during IES should make the procedure more informative due to the fact that grammatical processing and production requires more cognitive effort and, at the same time, it also incorporates elements of lexical search. A short test verifying the patient's ability to speak spontaneously ought to be used as well. The set of questions included in the test would additionally provide information on comprehension abilities during stimulation. (2) Underline the importance of the non-dominant right hemisphere (RH) in language function. The RH is responsible for cognitive function, non-literal speech, intonation, social cognition and inferential abilities. Right hemisphere IES language tests should include tasks on alternative meanings of words, broader semantic relationships and emotional prosody. (3) Point to the necessity of subcortical language mapping. The white matter is involved in language planning, initiation, articulation, prosody, comprehension and lexical selection. As fMRI or PET signal have little sensitivity for the white matter, mapping IES of the subcortex remains the only means to identify and preserve white matter language tracts. Subcortical IES requires the patient to be awake during the resection of tissue. Tests similar to those proposed for mapping both hemispheres of the cortex and an extended test on spontaneous speech should be carried out. All patients scheduled for IES should undergo a baseline language test to assess whether they exhibit language deterioration due to cerebral changes in areas affected by epilepsy or tumor. The patients undergoing cortical or subcortical IES should be trained to perform tests proposed for IES and pre-surgical brain scanning in order to make the testing procedure as effective as possible. Epileptic patients with intractable epilepsy who have an implanted subdural grid will not have to undergo such training prior to the implantation since they spend a few days with the grid in a ward. At the same time, they could serve as a reliable source of information in the initial stages of introducing the proposed tests for LH and RH. The tests will also be carried out post-surgically, within 1-3 days after resection and again, after a month, to assess the degree of language performance.