Advances in glioblastoma management

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Introduction

Resection of the maximum amount of tumoral tissue while preserving the function of the brain within or neighboring the tumor region established itself as a fundamental goal of modern oncologic neurosurgery. Maximal safe removal of the tumoral tissue has been documented extensively as a major prognostic factor for patients with glioblastoma (8). As such it became imperative for the oncologic neurosurgeon to be able to identify reliably the functional structures, cortical, subcortical, and vascular both preoperatively and in the operating room (5).

Mapping the eloquent areas of the brain has become a well-established technique using the intraoperative electrophysiology, with reliable methods and results (9,10,11). As well, preoperative mapping of the same areas using functional MRI and/or magnetoencephalography (MEG) has given clinically useful results in experienced hand (2, 3). However these methods do not provide any information about the white matter tracts that may be affected by invasive, intrinsic brain tumors. The advances in diffusion-tensor (DT) imaging techniques have been used to map white matter tracts in the normal brain (1, 4).

Methodology

The aim of our paper is to demonstrate the role of DT imaging in preoperative mapping of white matter tracts in relation to cerebral neoplasms and the way it can influence the operative decision in our practice. We discuss as well the methods used intraoperatively to identify and recognize functional areas and neighboring white matter tracts in the cases with glioblastoma (6, 7, 8). Ten patients suffering from this brain malignancy within or neighboring eloquent cortical areas underwent DT imaging examinations prior to tumor excision. Anatomical information about white matter tract location, orientation, and projections was obtained in every patient. Depending on the tumor type and location, evidence of white matter tract edema (one patient), infiltration (one patient), displacement (five patients), and disruption (three patients) could be assessed with the aid of DT imaging in each case. Diffusion-tensor imaging allowed for visualization of white matter tracts and was found to be beneficial in the surgical planning for patients with intrinsic brain tumors.

Conclusion

Our report is both a general and personal. In the first part we analyze the decision making process and protocol in the era of complex preoperative planning, microsurgery, ultrasound aspiration, neuronavigation, awake craniotomy, and

white matter tracts stimulation techniques in the surgical treatment of these cases. We present our experience using these technologies in combination with tractography in the treatment of 10 glioblastoma cases, affecting eloquent areas of the brain. The data strongly suggests that using both pre and intraoperative functional techniques improves significantly the results in terms of postoperative neurological status allowing for a safe maximal tumor removal.

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