Supratentorial Gliomas in Eloquent Areas: Which Parameters can Predict Functional Outcomes and Extent of Resection?

Giannantonio Spena MD; Pier Paolo Panciani; Marco Maria Fontanella
Department of Neurosurgery, Spedali Civili and University of Brescia, Italy

Introduction

Few biological and morphological parameters have been found to date that can aid in patient selection and surgical strategy for eloquent area tumors.

Methods

Retrospective, consecutive group of 70 patients harboring supratentorial gliomas in eloquent areas undergoing awake surgery. Parameters: neuroradiological (volume, degree of subcortical infiltration, contrast enhancement, cyst); neurological, hystological. End-points: extent of resection (EOR) and functional short- and long-term outcome. $X2$ analyses were used to evaluate parameters that could be predictive. Multivariate logistic regression analyses were used to evaluate the best combination to predict binary positive outcomes.

Results

The EOR: total in 27 (38.5%), subtotal in 37 (52.8%), partial in 6 (8.5%). In 90%, subcortical stimulation was positive in the margins of the surgical cavity. Postoperatively, 51% of the patients worsened; 90% of the patients regained their preoperative neurological score. Factors affecting negatively EOR: volume, degree of subcortical infiltration, presence of paresis ($P < 0.01$). Sharp margins and cystic components favoured gross total resection ($P < 0.01$). Contrast enhancement ($P < 0.02$), higher grade ($P < 0.01$), paresis ($P < 0.01$), and residual tumor in the cortex ($p < 0.02$) negatively affected long-term functional outcomes, whereas postoperative worsening could not be predict for any factor other than paresis. Subcortical responsiveness does not correlate to deterioration of functional status, both postoperatively ($P < 0.08$) and at follow-up ($P < 0.042$).

Conclusions

We obtained 88% correct predictions for EOR using the type of margins, volume, symptoms, cystic components, type of infiltration into the white matter. For follow-up Rankin, 95% correct predictions using histology, infiltration of functional cortex, preoperative paresis. Indication for this aggressive surgery must be carefully balanced with the risk of definitive functional impairment especially in those patients with high-grade gliomas who present with deficits.
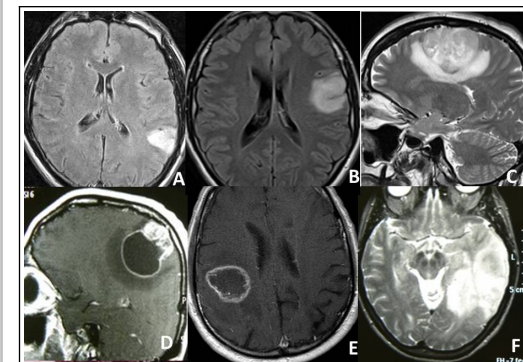
Learning Objectives

By the conclusion of this section, partecipants should be able to: 1) to consider direct mapping and awake surgery as a fundamental technique to treat EAT; 2) to pay more attention to the subcortical infiltration of gliomas; 2) to consider tumor morphology as a factor influencing the EOR and functional outcome; 3) to carefully consider aggressive surgery through direct mapping in patients with highgrade gliomas in eloquent areas who are already symptomatic.

References

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Five classes of subcortical infiltration patterns

Legends

Upper figure: the 5 classes of subocrtical infiltration patterns. A: tumors invading and confined to only 1 gyrus without infiltration of white matter connections; B: tumors invading 1 gyrus with extension to white matter and/or adjacent gyrus; C: tumors infiltrating up to 3 gyri and extending toward the long range white matter tracts; D the same as class C but with a large cystic component; E: tumors primarily located in the white matter under eloquent gyri; F: lobar tumors.
Lower fig. Outcome Based on Clinical, Demographic, and MRI Variables