

Introduction

Multimodal surgery is becoming the mainstay in neuro-oncology, either for lesions sited in eloquent areas or for those which involve apparently non-eloquent structures. Limitations to standard technology used to increase the extent of tumor resection, like neuronavigation, include the brain shift-phenomenon, particularly in cases of large or deeply-sited lesions, and non-fluorescent tumors. We report our institutional experience with the use of intraoperative Computed Tomography (i-CT) in brain tumor surgery.

Methods

74 patients (39 male, mean age 68.2), including 7 children, underwent microsurgical resection of brain tumors using i-CT. Histological diagnoses included high-grade gliomas (42) low-grade gliomas (14), metastases/other tumors (18). 48 patients, underwent 5-ALA fluorescence-guided microsurgery. 38 patients (21 male, mean age 63.3) in this series were prospectively recruited and treated with a multimodal intraoperative imaging protocol combining i-CT, i-US, 5-ALA and MRI-DTI guided navigation. 4 out of the last 38 patients underwent awake surgery. The protocol was approved by local ethic committee and all patients signed informed consent. Brain shift was measured on intraoperative scan compared to pre-operative MR, along two main vectors, one parallel and one perpendicular to the gravity line. Postoperative evaluation of extent of resection was based on early (within 48 hours) MRI.

Results

The rate of adjunctive resection after i-CT was 35.6% (26/73). EOTR was 100% in all but 11 cases. In these cases i-CT did not detect residual tumors.

The progressive shifting of the brain was documented and recorded during all procedures. Mean brain shift along the parallel vector was 15 mms, whereas perpendicular brain shift vector measured 4 mms, comparing i-CT with pre-operative imaging.

Conclusions

i-CT is a safe and useful tool to increase EOTR in brain tumor surgery. It is specific, more than i-US, to localize remnants, allowing a more reliable updating of the navigation system.

Learning Objectives

- To evaluate the impact of intraoperative CT in brain tumor surgery
- To distinguish the different role of i-CT according different tumor histology
- To understand a new procedure for brain shift correction and evaluation in clinical practice