

Does iMRI Improve 5-ALA Guided Resection of Glioblastoma?

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Introduction

Surgical treatment of glioblastoma remains challenging. New imaging modalities including 5-aminolevulinic (5-ALA) fluorescence and intraoperative MRI (iMRI) may improve surgical resection and prolong survival. We evaluated 5-ALA fluorescence versus low field iMRI for resection control in glioblastoma surgery.

Methods

14 patients with suspected glioblastoma received surgical treatment using 5-ALA induced fluorescence and frameless navigation. Following complete resection of 5-ALA fluorescent tissue, which was verified by two neurosurgeons, intra-operative low field MRI (Pole Star, Medtronic) was applied. If areas suspicious of tumor were identified they were biopsied under navigation guidance. Tissue samples were also taken from various 5-ALA enhancing locations before iMRI. All data were collected prospectively and the histological analysis was blinded.

Results

In 13 of 14 cases the diagnosis was glioblastona. One case of lymphoma was excluded from the study.

12 of 13 operations showed 5-ALA fluorescence, one case failed to show fluorescent tissue and was also excluded.

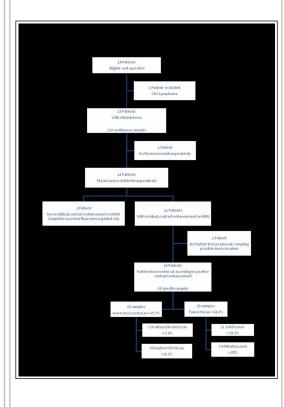
In 11 of 12 operations residual contrast enhancement on iMRI was found after complete resection of 5-ALA fluorescent tissue (91%). In one of these 11 cases the iMRI enhancement was in an eloquent area and hence the tissue biopsy was not carried out. The histological assessment of 28 samples of the remaining 10 cases which showed contrast enhancing residual tumour on iMRI showed tumour in 11 samples (39.3%), infiltration zone in 7 (25%), reactive CNS tissue in 9 (32.1%) and only 1 sample (3.6%) without pathological changes.

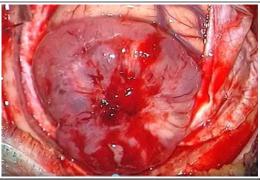
Conclusions

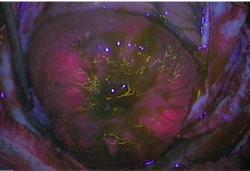
Not all glioblastoma tissue shows 5-ALA fluorescence and not all i-MRI contrasting regions contain tumor. I-MRI performed after complete resection of 5-ALA fluorescent tissue shows contrast enhancing regions suspicious of remnant glioblastoma in a very high percentage of cases (91%) and tissue samples taken from these locations reveal tumor or tumor infiltration zone in the majority of cases (64.3%). This data reveals the sensitivity limitations of 5-ALA fluorescence. However, due to low specificity the extended resection of i-MRI contrast enhancing areas has to be considered with caution in eloquent areas.

Learning Objectives

By the conclusion of this session, participants should be able to: 1)
Describe and discuss the diffences in intra-operative tumor identification with 5-ALA flourescence versus iMRI
2) discuss safety and efficacy in 5-ALA and iMRI guided glioblastoma resection.







Intra-operative 5-ALA fluorescence





i MRI enhancement and resection