

Usefulness of 5-aminolevulinic Acid (5-ALA) Fluorescence Guidance in Surgical Management of Intracerebral Metastases: A Retrospective Analysis

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Introduction

Microsurgical resection of intracerebral metastases should be performed pursuing radical resection to prevent local tumor recurrence. Intraoperative imaging tools may be used to increase the extent of resection. 5-aminolevulinic acid (5-ALA)-guided surgery has been demonstrated as an effective support in resection of high grade gliomas, and its role in the surgical management of other tumors (i.e. meningiomas) has been studied with promising results. The role of 5-ALA in the surgical management of brain metastases remains controversial.

Methods

We performed a retrospective analysis of intraoperative data from 33 consecutive patients (18 male) who underwent 5-ALA-fluorescence-guided surgery for intracerebral metastases. All patients underwent pre-operative Magnetic Resonance (MR) and oncological evaluation in order to assess life expectancy before surgery. Evaluation of 5-ALA fluorescence was performed and recorded during surgery and after completing tumor resection in each patient. Data were correlated with neuropathological findings in tissue specimens. Extent of tumor resection was evaluated by early post-operative gadolinium enhanced MR and volumetric analysis.

Results

No patients included in the study experienced drug-related complications after 5-ALA administration. 28 of the 33 metastases (84.8%) exhibited non-homogeneous fluorescence pattern of tumoral tissue with absence of fluorescent tissue in necrotic areas. Histological examination of non strongly fluorescent tumors revealed two cases of metastatic renal cancer, one case of metastatic chondrosarcoma and one case of metastatic lymphoma. Residual fluorescence of the resection cavity was detected after macroscopically complete white-light resection in 4 patients with 5-ALA fluorescence-positive metastases. In 15 cases a vague fluorescent area surrounding the tumor was visible. Histological examination of these areas was obtained in 5 cases, revealing gliotic tissue. Extent of tumor resection was 100% in all but one case.

Conclusions

5-ALA may be a valid tool to increase the extent of resection rate of brain metastases, but interpretation of intraoperative fluorescence data requires training.

Learning Objectives

- To interpret intraoperative differences of fluorescent areas in brain metastases.
- To understand the role of 5-ALA to detect residual metastases in selected cases.
- To recognize the presence of fluorescent non pathological gliotic areas comparing white light and fluorescent images.

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