EXTENDING THE INDICATIONS OF 5-AMINOLEVULINIC ACID FOR FLUORESCENCE-GUIDED SURGERY FOR DIFFERENT CENTRAL NERVOUS SYSTEM TUMORS: A SERIES OF 255 CASES IN LATIN AMERICA

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Introduction: Fluorescence guidance with 5-aminolevulinic acid (5-ALA) is a safe and reliable tool in total gross resection of intracranial tumors, especially malignant gliomas and cases of metastases. In the present retrospective study, we have analyzed 5-ALA-induced fluorescence findings in different central nervous system (CNS) lesions to expand the indications of its use in differential diagnoses.

Objectives: To describe the indications and results of 5-ALA fluorescence in a series of 255 cases.

Methods: In 255 consecutive cases, we recorded age, gender, intraoperative 5-ALA fluorescence tumor response, and 5-ALA postresection status, as well the complications related to the method. Postresection was classified as '5-ALA free' or '5-ALA residual'. The diagnosis of histopathological tumor was established according to the current classification of the World Health Organization (WHO).

Results: There were 195 (76.4%) 5-ALA positive cases, 124 (63.5%) of whom underwent the '5-ALA free' resection. The findings in the positive cases were: 135 gliomas of all grades; 19 meningiomas; 4 hemangioblastomas; 1 solitary fibrous tumor; 27 metastases; 2 diffuse large B cell lymphomas; 2 cases of radionecrosis; 1 inflammatory disease; 2 cases of gliosis; 1 cysticercosis; and 1 immunoglobulin G4-related disease.

Conclusion: Fluorescence with 5-ALA can be observed in lesions other than malignant gliomas or metastases, including meningiomas, hemangioblastomas, pilocytic astrocytomas, and lymphomas. Although there is need for further evidence for the use of 5-ALA beyond high-grade gliomas, it may be a safe and reliable tool to improve resection in positive tumors or to guide the histopathologic analysis in biopsies.

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Table 1 Tumors classified by types, 5-aminolevulinic acid (5-ALA) response, and removal status

Diagnosis	Total	5-ALA positive	5-ALA removal
Astrocytic and oligodendroglial			
Pilocytic astrocytoma, grade I	4	2	2 5-ALA free
Difuse astrocytoma, grade II	24	6	4 5-ALA free
Oligodendroglioma, grade II	7	1	1 5-ALA free
Anaplastic astrocytoma, grade III	6	3	1 5-ALA free
Anaplastic oligodendroglioma, grade III	10	9	7 5-ALA free
Glioblastoma, grade IV	108	104	59 5-ALA free, 7 biopsies
Astroblastoma	1	1	1 5-ALA free
Diffuse midline glioma	1	1	1 biopsy
Ependymal			
Subependymoma, grade I	3	1	1 5-ALA free
Ependymoma, grade II	8	5	3 5-ALA free
Anaplastic ependymoma, grade III	1	1	1 5-ALA free
Mixed neuronal-glial			
Ganglioglioma	4	0	–
Rosette-forming glioneuronal tumor	1	0	–
Dysplastic cerebellar gangliocytoma	1	0	–
Meningiomas			
Meningioma, grade I	17	17	16 5-ALA free
Atypical Meningioma, grade II	2	2	2 5-ALA free
Mesenchymal non-meningothelial			
Hemangioblastoma	4	4	4 5-ALA free
Solitary fibrous tumor	1	1	1 5-ALA free
Metastatic			
Adenocarcinoma, breast	10	6	4 5-ALA free
Adenocarcinoma, lung	12	12	7 5-ALA free/2 biopsies
Melanoma	5	2	2 5-ALA free
Small cells, kidney	2	1	1 5-ALA free
Adenocarcinoma, colon	1	1	1 5-ALA free
Adenocarcinoma, thyroid	1	1	1 5-ALA free
Adenoneuroendocrine carcinoma	3	3	1 5-ALA free/1 biopsy
Carcinoid tumor, lung	1	1	1 5-ALA free
Other tumors			
Diffuse large B-cell lymphoma	3	2	1 5-ALA free, 1 biopsy
Schwannoma	1	0	–
Non-neoplastic			
Radionecrosis	2	2	2 5-ALA residual
Inflammatory	2	1	1 5-ALA free
Gliosis	6	2	2 5-ALA residual, 1 biopsy
Cysticercosis	1	1	1 5-ALA free
Demyelinating disease	2	1	1 biopsy

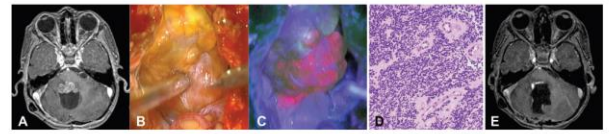

Fig. 1 Illustrative case of a grade-II ependymoma: (A) preoperative magnetic resonance imaging (MRI) scan. (B) intraoperative finding; (C) positivity for 5-aminolevulinic acid (5-ALA); (D) histopathological finding; (E) postoperative MRI.

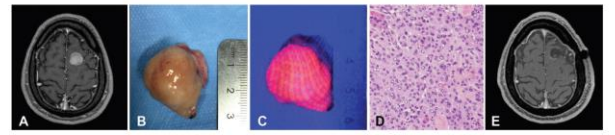

Fig. 2 Illustrative case of a grade-I meningioma: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding; (E) postoperative MRI.

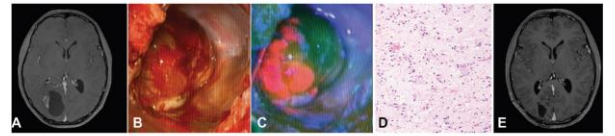

Fig. 3 Illustrative case of a pilocytic astrocytoma: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding; (E) postoperative MRI.

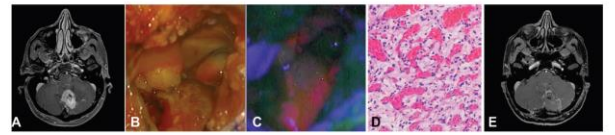

Fig. 4 Illustrative case of a hemangioblastoma: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding; (E) postoperative MRI.

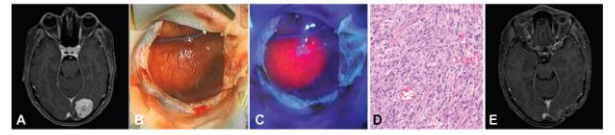

Fig. 5 Illustrative case of Solitary fibrous tumor: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding; (E) postoperative MRI.

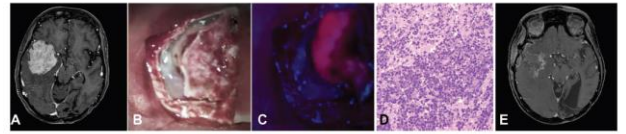

Fig. 6 Illustrative case of a diffuse large B-cell lymphoma: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding; (E) postoperative MRI.

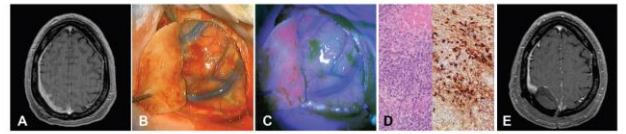

Fig. 7 Illustrative case of immunoglobulin G4-related disease: (A) preoperative MRI; (B) intraoperative finding; (C) 5-ALA positivity; (D) histopathological finding (left) with immunochemistry (right); (E) postoperative MRI.