

Experience with 5-aminolevulinic acid in the surgery of high-grade glial tumors

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Abstract

The approach to brain tumors requires the coordinated work of a multidisciplinary team of specialists. Currently, surgery in malignant gliomas is the main method to confirm the degree of malignancy and remove the tumor mass. Fluorescence-guided surgery (FGS) is an imaging technique based on optics that allows the visualization of structures invisible to the human eye, as well as the evaluation of dynamic activities such as organ perfusion. Some of the most commonly used drugs in neurosurgery are 5-Aminolevulinic acid (5-ALA), Fluorescein and Indocyanine Green.

Keywords

5-Aminolevulinic; neurosurgery; glioma; oncology.

Introduction

The term malignant glioma includes a number of tumors: glioblastoma multiforme (GBM), anaplastic astrocytoma (AA), anaplastic Oligodendroglioma (OA). All of them have in common their origin at the glial level, the high capacity to infiltrate the surrounding brain tissue and the impossibility of being cured. GBM is the most frequent and aggressive tumor with a median survival of 10-12 months, while AA and OA tend to appear at younger ages, less than 50 years, and to have a median survival of approximately 24 months. The incidence of malignant gliomas is 3.8 cases per 100,000 habitant/year. Their incidence seems to have increased in recent years, mainly in the population over 65 years of age [1].

The treatment of malignant gliomas requires the coordinated work of a multidisciplinary team of specialists who comprehensively address all the patient's needs. Surgery allows confirmation of the diagnosis, staging of the tumor and also represents the main therapeutic plan by removing the tumor mass

[2,3].

Fluorescence-guided surgery uses 5-ALA to facilitate the visualization of structures invisible to the human eye, as well as to evaluate dynamic activities such as organ perfusion. It is actively absorbed in the intestine and passes poorly through the healthy blood-brain barrier, but well through the altered one [4]. The administration of 5-ALA causes an overload of the cellular metabolism of porphyrins and accumulation in highgrade glioma cells. When using blue light it is intensely fluorescent [5].

Case Presentation

We present the case of a 36-year-old woman with distant recurrence of WHO IV IDH + right frontal glioblastoma (GB). It was decided to perform frontal lobectomy and supramarginal excision using fluorescence-guided surgery (Figure 1).

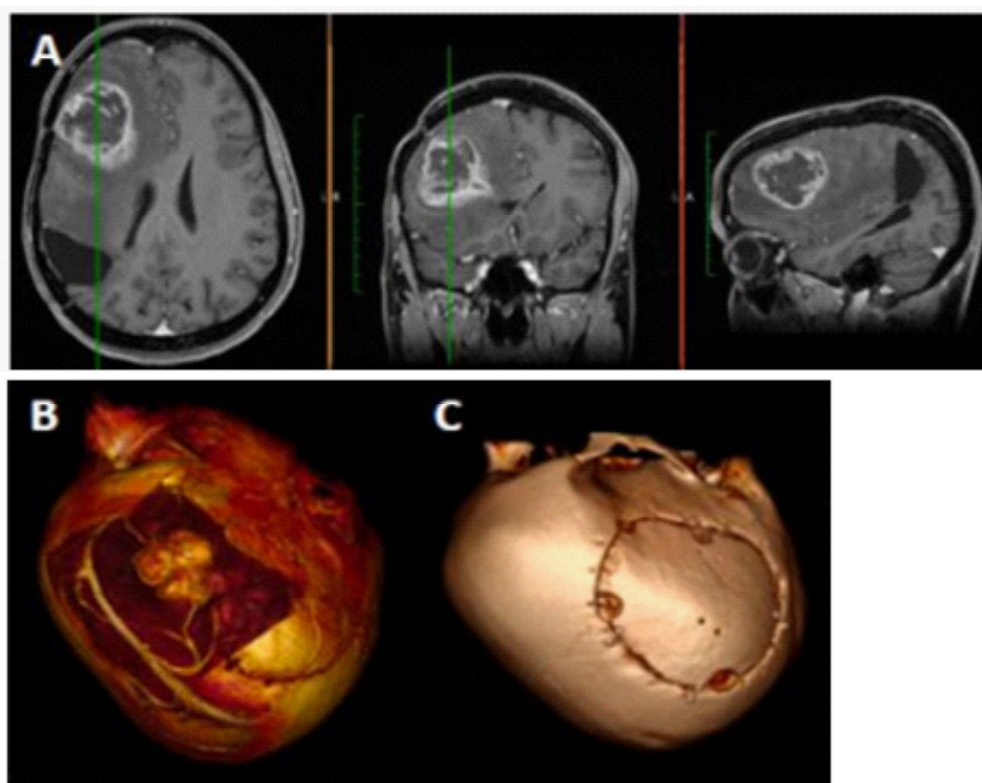


Figure 1: A: Pre-operative MRI coronal axial and sagittal slices. B-C: 3D reconstruction of the lesion and the previous craniotomy using preoperative MRI and CT.

The 5-ALA dilution (dose 20 mg/kg diluted in 50 ml of water) was prepared in the pharmacy department, and a protocol of recommendations was designed. The dilution was administered orally the night before the procedure. Light exposure of the patient was avoided until entering the operating room.

Fluorescence-guided resection was used to complete the frontal lobectomy and supramarginal excision of the lesion until no fluorescence-positive remnants were observed. The usual 3 types of fluorescence intensities (intense, moderate and mild) were observed as described in the literature. Since it was a non eloquent area, the fluorescence facilitated a wide resection without causing any postoperative deficits (Figure 2).

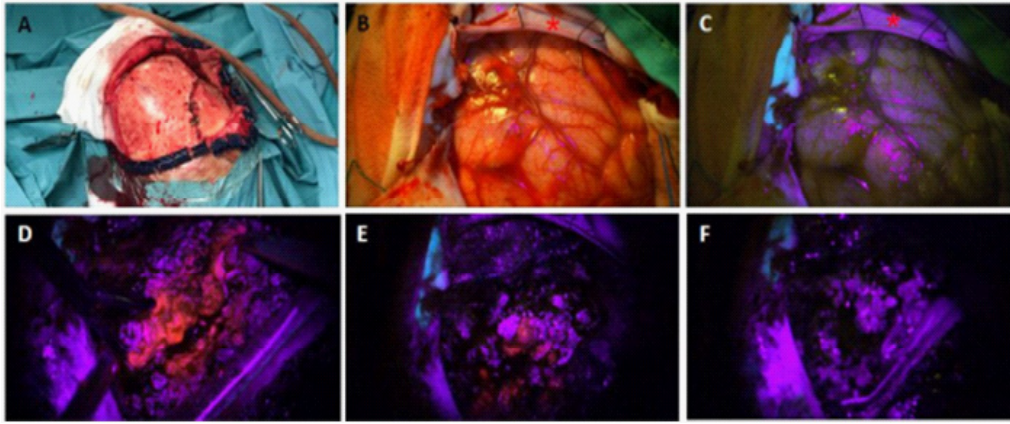


Figure 2: Intraoperative images. **A:** Image after skin opening. The skull and the previous craniotomy can be seen. **B-C:** Intraoperative images after craniotomy and opening of the dura (*) without and with fluorescence optical filter. **D:** Microscopic image of the tumor resection. Intense fluorescence patterns of intense, moderate and mild fluorescence can be seen. **E:** Microscopic image with more advanced resection showing less tumor volume and only mild fluorescence pattern. **F:** Microscopic image after completion of resection. No tumor remnants or fluorescence can be seen.

Conclusion

Fluorescence-guided tumor surgery in high-grade glial tumors has been shown to achieve higher rates of complete resection compared to the classical technique. In certain studies these higher degrees of tumor resection have achieved a higher rate of postoperative neurological deficits. This makes this type of surgery ideal for high grade glial lesions located in non eloquent areas where a more radical resection will not result in higher rates of neurological focalities.

In our patient, being a lesion lodged in a not particularly eloquent area (right frontal lobe), radical resection did not lead to any postoperative neurological deficits.

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References

1. ER Laws, IF Parney, W Huang, F Anderson, AM Morris, A Asher, et al. Survival following surgery and prognostic factors for recently diagnosed malignant glioma: Data from the Glioma Outcomes Project. *Neurosurg.* 2003; 99: 467-473
2. R Stupp, N Pavlidis, S Jelic, for the ESMO Guidelines Task Force. ESMO minimum clinical recommendations for diagnosis, treatment and follow-up of malignant glioma. *Ann Oncol.* 2005; 16: i64-i65.
3. N Sanai, MY Polley, MW McDermott, AT Parsa, MS Berger. An extent of resection threshold for newly diagnosed glioblastomas. *J Neurosurg.* 2011; 115: 3-8.
4. W Stummer, U Pichlmeier, T Meinel, OD Wiestler, F Zanella, HJ Reulen. Fluorescence-guided surgery with 5-aminolevulinic acid for resection of malignant glioma: A randomised controlled phase III trial. *Lancet Oncol.* 2006; 7: 392-401.
5. R Diez Valle, J Slof, J Galván, C Arza, C Romariz, C Vidal. Retrospective observational study on the effectiveness of 5-aminolevulinic acid in the treatment of malignant gliomas in Spain (VISIONA Study). *Neurology.* 2013.

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