5-aminolevulinic acid Guided Resection Indications

5-aminolevulinic-acid (5-ALA) guided resection. In addition to stereotactic localization, as well as intraoperative brain mapping, techniques to enhance visual identification of tumor, intraoperatively may be used and include 5-aminolevulinic acid (5-ALA). 5-ALA is metabolized into fluorescent porphyrins, which accumulate in malignant glioma cells. This property permits the use of ultraviolet illumination during surgery as an adjunct to map out the tumor. This has been proven with RCT where the use of 5-ALA leads to more complete resection (65% vs. 36%, $p < 0.0001$), which translates into a higher 6-month progression-free survival (41% vs. 21.1%, $p = 0.0003$) but no effect on OS [1].

New indications are being considered especially in benign lesion biopsies with the assistance of 5-ALA. Using fluorescence as an aid in biopsies may improve procedure time, the number of samples, and the necessity of intraoperative pathology. Further studies should include this technology to encourage more beneficial uses [2].

It facilitates tumor identification; its use improves gross total resection rates and prolongs progression free survival in patients with high-grade gliomas [3], [4].

5-aminolevulinic-acid fluorescence-guided resection of glioma

5-aminolevulinic-acid fluorescence-guided resection of glioma.

5-aminolevulinic-acid fluorescence-guided resection of brain metastases

5-aminolevulinic-acid fluorescence-guided resection of brain metastases.

5-aminolevulinic-acid fluorescence-guided resection for intraventricular tumor

5-aminolevulinic-acid fluorescence-guided resection for intraventricular tumor

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see 5-aminolevulinic acid fluorescence guided resection of intracranial meningioma

see 5-aminolevulinic acid fluorescence guided resection in children

see 5-aminolevulinic acid fluorescence guided resection and intraoperative monitoring

see 5-aminolevulinic acid fluorescence guided resection of spinal tumor.

Meningeal sarcoma

First case published in the literature of meningeal sarcoma in a child in which intraoperative fluorescence with 5-ALA was used to achieve a complete resection [5].

Meningioma

Metabolic imaging tools such as 5-ALA fluorescence-guided resection and navigated FET-PET were helpful for the resection of complex-shaped, recurrent skull base meningioma. 5-ALA fluorescence was useful to dissect the adherent interface between tumor and brain. Furthermore, it helped to delineate tumor margins in the nasal cavity. FET-PET improved the assessment of bony and dural infiltration. We hypothesize that these imaging technologies may reduce recurrence rates through better visualization of tumor tissue that might be left unintentionally. This has to be verified in larger, prospective trials [6].

Tumor fluorescence can occur in benign meningiomas (WHO grade I) as well as in WHO grade II and WHO grade III meningiomas. Most of the reviewed studies report fluorescence of the main tumor mass with high sensitivity and specificity. However, different parts of the same tumor can present with a different fluorescent pattern (heterogenic fluorescence). Quantitative probe fluorescence can be superior, especially in meningiomas with difficult anatomical accessibility. However, only one study was able to consistently correlate resected tissue with histopathological results and nonspecific fluorescence of healthy brain tissue remains a confounder. The use of 5-ALA as a tool to guide resection of intracranial meningiomas remains experimental, especially in cases with tumor recurrence. The principle of intraoperative fluorescence as a real-time method to achieve complete resection is appealing, but the usefulness of 5-ALA is questionable. 5-ALA in intracranial meningioma surgery should only be used in a protocolled prospective and long-term study [7].

5-aminolevulinic acid fluorescence-guided resection of pediatric brain tumor

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