# Glioblastoma Maximal Safe Resection

Achieving a maximal safe Glioblastoma extent of resection during brain tumor surgery is the goal for improved patient prognosis. Fluorescence-guided surgery using 5-aminolevulinic acid (5-ALA) induced Protoporphyrin IX has thereby become a valuable tool enabling a high frequency of complete resections and a prolonged progression free survival in glioblastoma patients.

Erkkilä et al., from the Center for Medical Physics and Biomedical Engineering, Medical University of Vienna, Advanced Development Microsurgery, Carl Zeiss Meditec AG, Christian Doppler Laboratory for Innovative Optical Imaging and Its Translation to Medicine, Medical University of Vienna, Institute of Neurology, Department of Neurosurgery, General Hospital and Medical University of Vienna, presented a widefield fluorescence lifetime imaging device with 250 mm working distance working under similar conditions like surgical microscopes based on a time-of-flight based dual tap CMOS camera. In contrast to intensity-based fluorescence imaging this method is invariant to light scattering and absorption while being sensitive to the molecular composition of the tissue. They evaluated the feasibility of lifetime imaging of Protoporphyrin IX using the system to analyze brain tumor phantoms and fresh 5-ALA labeled human tissue samples. The results demonstrate the potential of this lifetime sensing device to go beyond the limitation of current intensity-based fluorescence-guided neurosurgery [1)].

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Surgery in a contemporary setup using iMRI, brain mapping and modern adjuvant treatment, has a higher OS and lower complication rates as previously published. A maximum but safe resection should be the goal of surgery since a perioperative complication significantly decreases OS. Recurrent surgery has a beneficial effect on OS without an increase of complications [2)].

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Safely performed maximal surgical resection is shown to significantly increase progression free survival and overall survival while maximizing quality of life. Upon invariable tumor recurrence, re-resection also is shown to impact survival in a select group of patients. As adjuvant therapy continues to improve survival, the role of surgical resection in the treatment of glioblastoma looks to be further defined.

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During surgery, identifying margins of brain tumors, particularly glioblastomas (Glioblastomas) and highly invasive neoplasms, remains a technical challenge. Thus, for both benign and malignant brain tumors, the most common cause of relapse is local recurrence at the resection margins. At the time of the operation, surgeons typically use visual inspection and tactile discrimination to differentiate tumor margins from surrounding normal brain parenchyma. In addition, imaging adjuncts such as navigation and intraoperative ultrasound can provide value. However, this method has many limitations, which accounts for the high rate of local failure.

Intraoperative adjunctive technologies, such as imaging-based navigational systems, have been useful in allowing the surgeon to estimate areas of contrast enhancement, which likely represent tumor. Although ultrasound-based re-registration can be used to account for brain shift, navigation alone is hampered by the inaccuracies attributable to brain shift and poor resolution when performing

surgery in vivo. For the past 2 decades, intraoperative fluorescent contrast agents have been proposed to aid the neurosurgeon in identifying tumor tissue during surgery. The most popular approach has been fluorescent-guided intraoperative imaging with 5-aminolevulinic acid fluorescence guided resection. This method has been studied since the 1990s [3) 4)]

It is difficult to reproducibly judge extent of resection (EOR in these studies due to the lack of reliable tumor segmentation methods, especially for postoperative magnetic resonance imaging (MRI) scans. Therefore, a reliable, easily distributable segmentation method is needed to permit valid comparison, especially across multiple sites [5)].

Treatment advances will depend on identifying agents that target mechanistic vulnerabilities that are relevant to specific subgroups of patients; increasing patient enrollment into clinical trials is essential to accelerate the development of patient-tailored treatments [6)].

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Most studies that examine the notion of gross total resection (GTR) in glioblastoma treatment are conducted with the assumption that extended survival is universally desirable [7)].

There are limited data in terms of how such survival benefits should be weighed against the risk of the surgery and the impact of surgical morbidity on the patient's quality of life [8)].

To study this issue, Chen et al., designed a survey entitled Putting yourself in your patient's shoes: a pilot study of physician personal preferences for treatment of glioblastoma (U.C.S.D. institutional review board protocol no. 151821), where they survey physician members who have cared for glioblastoma patients. These physicians are well-acquainted with the consequences of surgery performed for glioblastoma located in different regions.

They pose the question of whether the respondent would elect for GTR if s/he were afflicted with glioblastoma located in the right frontal lobe, right hemisphere, left hemisphere, or the posterior corpus callosum.

Information on physician age, marital status, medical specialty (neurosurgery, neuro-oncology, medical oncology, neuroradiology, neuropathology or radiation oncology), years of practice, and personal values will be collected.

They would like to make neurosurgeons in Europe aware of this study, and to invite them to take part in it. They hope this study will give us more insight into our own preferences as physicans, when faced with the decision we council our patients on how to make on a daily basis.

To participate in the study please go to the following webpage by 31 October 2016: http://www.surveymonkey.com/r/Eu_preference_Glioblastoma [9)].

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