

## **LABEL-FREE FLUORESCENCE LIFETIME TECHNIQUES FOR IMAGE-GUIDED INTERVENTIONS**

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Adequate assignment of tumor margins intra-operatively requires rapid evaluation of the extent of neoplastic changes. Measurements of tissue autofluorescence properties can address this need. This presentation overviews mesoscopic fluorescence lifetime spectroscopy and imaging techniques as a means for label-free guidance of surgical interventions. In contrast to intensity or spectral-based measurements, lifetime measurements are minimally affected by factors such as irregular tissue surfaces, non-uniform illumination, and the presence of endogenous absorbers such as blood in the surgical field.

Here, we demonstrate advances in clinically-compatible multispectral fluorescence lifetime imaging (FLIM) – based devices and their ability to operate in conjunction with the neuronavigation system and the Vinci surgical robotic platform. We present clinical studies in patients undergoing surgery that demonstrate the potential of FLIM for real-time intraoperative assessment of brain tumors infiltrative edges. Also, we show results demonstrating FLIM's ability to demarcate the extent of the oropharyngeal tumor in patients undergoing trans-oral robotic surgery (TORS) procedures. Challenges and solutions for the clinical implementation of these techniques are discussed.