

MULTIMODAL VISIBLE LIGHT OPTICAL COHERENCE MICROSCOPY AND FLUORESCENCE IMAGING OF 5-ALA-POSITIVE GLIOMA SAMPLES

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INTRODUCTION

Optical imaging plays a crucial role in neuroscience, especially in brain surgery [1]. Neurosurgeons are using fluorescence imaging (FI) during the surgery to distinguish healthy and tumorous brain areas [2]. However FI only provides limited information about tissue morphology. Optical coherence microscopy (OCM) is a nondestructive optical imaging technique, which is able to acquire three-dimensional images with micrometer resolution in real time [3]. Here we demonstrate a combination of OCM and FI in order to both visualize the microstructure of the tumor and to get tumor specific contrast.

METHODS AND RESULTS

Using a single light source we developed a custom-made multimodal visible light OCM and FI setup to investigate 5-aminolevulinic acid (5-ALA) positive tumor biopsies. The combined setup achieves a high axial and transversal resolution of 0.8 μm and 2.0 μm . 5-ALA positive brain biopsies, retrieved from surgery were investigated. Fig. 1 (a) shows the histology of the tumor infiltration zone. In the infiltration zone, areas of normal brain tissue with infiltrating malignant cells can be observed. In Fig. 1 (b), the morphological structure of the region is resolved in two and three dimensions. Figure 1 (c) shows the OCM image with the tumor affected infiltration zone. In Fig. 1 (d), the OCM and FI data were overlaid. In conclusion, our combined setup was able to image 5-ALA positive brain biopsies using OCM and FI, to simultaneously visualize the morphological structure and provide tumor specific contrast.

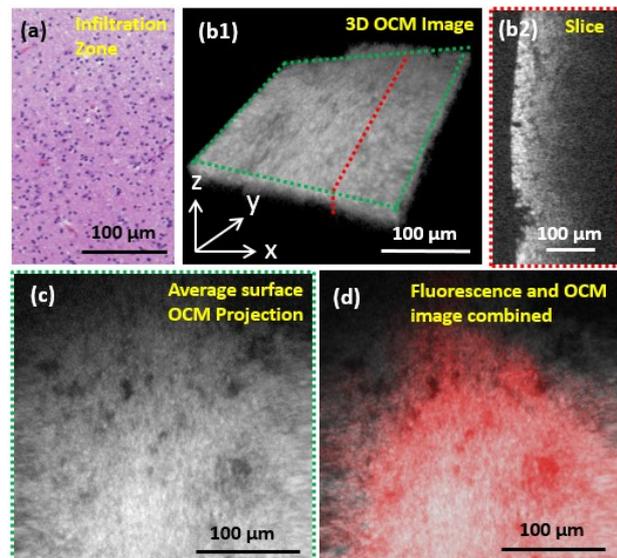


Fig. 1 5-ALA positive brain biopsy imaging. **(a)** Histology (hematoxylin and eosin staining). **(b1)** OCM 3D rendering. **(b2)** Representative OCM slice. **(c)** OCM averaged surface projection. **(d)** Combined OCM (grey) and FI (red) image.

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