In Vivo Labeling for Ex Vivo 3D Tracking of CAR T Cells

Methods

Introduction

Classic histology and 2D microscopy are unable to provide 3D representative overview of the heterogeneous tumor physiology and distribution of cellular therapies within and around the tumor. In this proof-of-concept study we present the combination of multispectral fluorescence ultramicroscopy (UM) with tissue clearing and in vivo labeling of CAR T cells. This platform allows 3D visualization and quantification of multiple tumor parameters and CAR T cell penetration at a cellular level.

Figure 1

Figure 2

Figure 3

Figure 4

Results

High binding specificity of the vessel marker rhodamine-lectin in combination with fluorescent properties of the Vio 667 mAb fluorescence signals resulted in a high signal-to-noise ratio. Chaotic, irregular, and highly branched vascular structures, typical of an angiogenic vasculature, within a tumor with a high degree of complexity and resolution, in contrast to large and less torturous feeding vessels (fig. 4).

Conclusion and Outlook

The combination of UM, EC-based clearing, and in vivo labeling is a valuable analysis platform allowing 3D visualization to better understand cellular treatments of solid tumors.

References

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