

A Novel Intravital Imaging Window for Longitudinal Microscopy of Mouse Ovary

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Abstract

The ovary is a dynamic organ, undergoing complex changes throughout the ovulatory cycle. Its structural components, such as vasculature, ovarian epithelium, and extracellular matrix are involved not only in the maintenance of the ovarian function, but also participate in cancer progression as part of the invasive tumor stroma. Multiple aspects of ovarian physiology, as well as growth of orthotopic tumors in the ovary remain understudied; this is largely due to the lack of imaging tools that would allow following up these dynamic processes, in high resolution, over time. For this purpose, we have developed the first ovarian imaging window that permits continuous intravital imaging of the mouse ovary, with the two-photon microscope.

We demonstrate the feasibility of utilizing endogenous tissue autofluorescence and second harmonic signal to image characteristic ovarian structures of unsectioned, freshly excised ovaries, and *in-vivo* through the imaging window. Ovarian surface epithelium, the underlying layer of collagen and different maturation stages of the ovarian follicles were imaged with high resolution. Intravital imaging revealed follicular growth, remodeling of the vasculature and formation of corpora lutei. Finally, our approach allowed observation of tumor invasion into the ovary, including interaction of tumor cells with the collagen and the formation of invasive tumor stroma.