Visualization of Tumor Response to Neoadjuvant Therapy for Rectal Carcinoma by Nonlinear Optical Imaging

The continuing development of nonlinear optical imaging techniques has opened many new windows in biological exploration. In this study, a nonlinear optical microscopy—multiphoton microscopy (MPM) was expanded to detect tumor response in rectal carcinoma after neoadjuvant therapy; especially normal tissue, pre- and post-therapeutic cancerous tissues were investigated in order to present more detailed information and make comparison. It was found that the MPM has ability not only to directly visualize histopathologic changes in rectal carcinoma, including stromal fibrosis, colloid response, residual tumors, blood vessel hyperplasia, and inflammatory reaction, which had been proven to have important influence on estimation of the prognosis and the effect of neoadjuvant treatment, but also to provide quantitative optical biomarkers including the intensity ratio of SHG over TPEF and collagen orientation index. These results show that the MPM will become a useful tool for clinicians to determine whether neoadjuvant therapy is effective or treatment strategy is approximate, and this study may provide the groundwork for further exploration into the application of MPM in a clinical setting.