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Autor(en) des Beitrags: Ale, Angelique, A; Ermolayev, Vladimir, V; Herzog, Eva, E; Cohrs, Christian, C; de Angelis, Martin Hrabé, MH; Ntziachristos, Vasilis, V


Abstract: The development of hybrid optical tomography methods to improve imaging performance has been suggested over a decade ago and has been experimentally demonstrated in animals and humans. Here we examined in vivo performance of a camera-based hybrid fluorescence molecular tomography (FMT) system for 360° imaging combined with X-ray computed tomography (XCT). Offering an accurately co-registered, information-rich hybrid data set, FMT-XCT has new imaging possibilities compared to stand-alone FMT and XCT. We applied FMT-XCT to a subcutaneous 4T1 tumor mouse model, an Aga2 osteogenesis imperfecta model and a Kras lung cancer mouse model, using XCT information during FMT inversion. We validated in vivo imaging results against post-mortem planar fluorescence images of cryoslices and histology data. Besides offering concurrent anatomical and functional information, FMT-XCT resulted in the most accurate FMT performance to date. These findings indicate that addition of FMT optics into the XCT gantry may be a potent upgrade for small-animal XCT systems.

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