Emerging Optical Imaging Technologies and Molecular Diagnostics for Bladder Cancer

by

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Abstract

Bladder cancer is one of the most common cancers and poses substantial unmet diagnostic and therapeutic needs. Early stage bladder cancer is amenable to endoscopic interventions but has high recurrence rates and requires intensive surveillance, thereby incurring the highest lifetime treatment cost of all cancers. Our research focuses on development and validation of new optical image-guided surgery technologies and urine-based molecular diagnostics for bladder cancer. For optical imaging, we are investigating wide-field fluorescence imaging, confocal endomicroscopy, and endoscopic molecular imaging to improve detection, characterization, and image-guided resection. We identified CD47 as a promising imaging and therapeutic target for bladder cancer, and established a robust translational pipeline including in vitro, ex vivo, and in vivo validation with patient-derived tissue samples and mouse models. For urine-based molecular diagnostics, we are applying next-generation sequencing technologies as a discovery tool to identify promising biomarker panels. Initial validation using a panel of RNA targets against patient-derived urine samples demonstrated significant improvement over cytology-based standards. Ongoing research includes identification of prognostic biomarkers as well as system integration with microfluidics platforms to enable point-of-care detection. Overall, bladder cancer represents a challenging clinical entity with unmet needs that are ideally suited for a team-science approach involving clinical, basic, and engineering sciences.

Short Biography

Joseph Liao is a surgeon-scientist and Associate Professor of Urology at Stanford University. He earned his A.B. in Biology from Harvard University in 1993 and M.D. from Stanford School of Medicine in 1997. After completing his urology residency and fellowship at UCLA, he joined the department of urology at Stanford in 2006, where he is also a member of Stanford Cancer Institute and Bio-X interdisciplinary research program. As the Chief of Urology at the Veterans Affairs Palo Alto Health Care System, a major Stanford-affiliated teaching hospital, Dr. Liao maintains an active clinical practice focusing on minimally invasive surgery and urologic oncology. His laboratory interests include development and translation of optical molecular imaging for urological cancer and urine-based molecular diagnostics. His research group has pioneered the application of
confocal endomicroscopy in the urinary tract, endoscopic molecular imaging of bladder cancer, an in vitro molecular diagnostics for urinary tract infections and bladder cancer. His research has been funded by the National Institutes of Health, National Science Foundation, and the Department of Veterans Affairs. He has authored over 100 manuscripts, served as the editor of the textbook *Advances in Image-Guided Urologic Surgery*, and mentored over 30 students, fellows, and trainees. He has been an invited speaker and organizer to numerous international meetings including the Gordon Research Conferences, IEEE-NANOMED, IEEE-NEMS, SPIE, Society of Urologic Oncology, Endourology Society, American Urological Association, and European Association of Urology.

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**Time:** 16:30

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