Nanofluorophore assisted fluorescence image-guided cancer surgery

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Surgical resection is still the major treatment for solid tumors. The complete surgical resection of the cancer tissues in the surgery is essential to the prognosis of cancer patients. However, 40% of the US patients have the local recurrence in 5 years from the initial surgery, due to the failure to detect all the cancer tissues intraoperatively. In the surgery, in case of uncertainty, the surgeon may take biopsies and send for the frozen section procedure. This pathological procedure is expensive and inefficient: it may take 20-30 min, while keeping the patient under anesthesia; due to the non-optimal preparation of the tissues, the diagnosis accuracy is lower than "formalin fixed paraffin embedded tissue procedure". The latter procedure takes even longer time (several hours to days after the surgery) to obtain the diagnosis result. Our lab developed an imaging system, together with ICG-protein complex as nano-imaging contrast agent, to help the intraoperative diagnosis of tissues. We have conducted dozens of clinical trials on human pancreatic cancer in major hospitals in USA. Over two hundred sample tissues from various pancreatic cancer surgeries, including distal pancreatectomy, whipple procedure, and total pancreatectomy, were inspected with our imaging system. Within one sec, our device can quantitatively differentiate cancerous tissues from non-cancerous tissues intraoperatively: Primary tumor and positive margins showed more than 200% stronger ICG fluorescence than normal tissues and negative margins did. The overall diagnosis accuracy of cancer by our system is 94.9%.

Speaker Biography

Jian Xu is currently an Assistant Professor in the Division of Electrical and Computer Engineering at Louisiana State University, USA. He has received his PhD degree in Engineering from the Yale University, USA. His work has been published on well-recognized journals (e.g. *Nature Nanotechnology* (IF: 38.986), *Advanced Materials* (IF: 19.791), and *Soft Matter*) and widely reported by international media (e.g. Süddeutsche Zeitung-the largest newspaper in Germany, the Economist, and Science Daily). He is a reviewer of IEEE transactions on biomedical engineering, IEEE international symposium on circuits and systems, Full Member of Sigma Xi, and so on. His research interests include biomedical instrumentation for image-guided surgery and biomimetic energy harvesting scheme with bio-nano electronics. His medical devices have been put into clinical trials in several major hospitals in US.

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