

Nayar Prize I Phase II Quarterly Progress Report – July 2018

Project: ADEPT Cancer Imager

Team: Jovan Brankov, Raju Mehta, Ken Tichauer

Students: Yusairah Basheer, Kushal Herur, Cynthia Li, Negar Sadeghipour, Lagnojita Sinha, Veronica Torres, Dawid Walus

Progress Summary

Highlights:

This quarter, the ADEPT team published two scientific articles (*Journal of Surgical Oncology* and *Journal of Biomedical Optics*); had five abstracts selected for presentation at the upcoming World Molecular Imaging Congress in September 2018 in Seattle, Washington; made a significant breakthrough in ADEPT system design to make it possible to construct as substantially lower cost (findings written up and submitted to *Biomedical Optics Express*), and established a connection with a breast cancer surgeon at Sanford Health, Sioux Falls, South Dakota to plan a clinical trial on lymph node assessment with the ADEPT system.

- (1) *April 15, 2018:* Material transfer agreement established with Prof. Kristi Eglund (breast cancer molecular biologist) and Dr. Jesse Dirksen (breast cancer surgeon) at Sanford Health, Sioux Falls, South Dakota to collaborate on clinical trial using ADEPT system. Clinical study will include use of breast cancer specific antibody designed by Prof. Eglund and 100 breast cancer patient sentinel lymph nodes.
- (2) *May 6, 2018:* Invited review article with an overview of noninvasive methods for detecting cancer spread to tumor draining lymph nodes **accepted** for publication in the *Journal of Surgical Oncology*.
 - a. C Li, VC Torres, KM Tichauer. Noninvasive detection of cancer spread to lymph nodes: a review of molecular imaging principles and protocols. *Journal of Surgical Oncology*. (Reference #: JSO-2018-0259)
- (3) *May 29, 2018:* The ADEPT team has five abstracts selected to be presented at the World Molecular Imaging Congress, Seattle, WA, September 2018:
 - a. C Li, X Xu, Y Basheer, VC Torres, JG Brankov, KM Tichauer. Detecting breast cancer micrometastases in resected whole lymph nodes using paired-agent fluorescent imaging: imaging agent administration methods.
 - b. C Li, X Xu, KM Tichauer. Noninvasive detection of sentinel lymph node metastases using paired-agent imaging with indocyanine green as a control agent for an antibody-based targeted imaging agent.

- c. VC Torres, L Sinha, C Li, JG Brankov, KM Tichauer. Guiding lymph node pathology with an early photon dual wavelength fluorescent optical projection tomography system.
 - d. N Sadeghipour, SC Davis, KM Tichauer. Cell-surface receptor concentration imaging by paired-agent method and correcting for tissue optical property differences within the kinetic model.
 - e. N Sadeghipour, G Lu, EL Rosenthal, SC Davis, KM Tichauer. A non-invasive method to measure antibody receptor occupancy using paired-agent imaging with affibodies to accurately estimate receptor concentration.
- (4) *June 19, 2018*: Cynthia Li and Veronica Torres awarded Student Travel Stipend Awards to the World Molecular Imaging Congress, Seattle, WA, September 2018.
- (5) *June 21, 2018*: Article with description of an improved molecular imaging protocol to quantify cancer-specific receptors **published** in the *Journal of Biomedical Optics*:
- a. N Sadeghipour, SC Davis, KM Tichauer. Correcting for targeted and control agent signal differences in paired-agent molecular imaging of cancer cell-surface receptors. *Journal of Biomedical Optics*, 23(6) 066004, 2018.
- (6) *June 30, 2018*: Article demonstrating the ability of low-cost angular domain photon detection for resolving micrometastases in lymph nodes **submitted** to *Biomedical Optics Express*:
- a. L Sinha, C Li, F Massanes, KM Tichauer, JG Brankov. Comparing spatial resolution improvement by early photon and angular domain light detection methods: a simulation study. *Biomedical Optics Express*, **Submitted**.

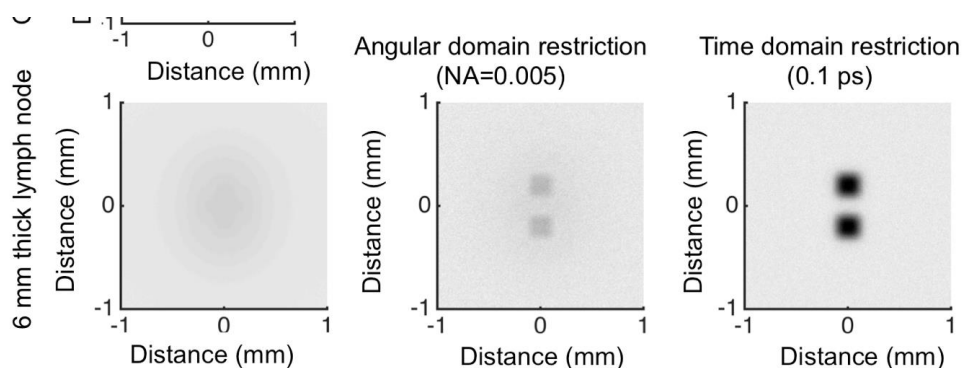


Figure 1: Demonstration that 200 micron-sized objects can be resolved in lymph nodes using low-cost angular-domain early photon methods compared, and resolution is comparable to high-cost time-domain early photon methods.