Dana-Farber Cancer Institute

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This year, breast cancer will claim the lives of more than 500,000 people worldwide. Most of these will be women in whom the disease has spread to the rest of the body, known as metastatic breast cancer. Women living with metastatic breast cancer typically receive ongoing, single-agent treatments that are effective for awhile, but at some point, the disease develops resistance, evading a previously effective therapy and growing again. HER2-overexpressing (HER2-positive) breast cancer is a subtype that accounts for 20-25% of breast cancers, and is associated with faster growing tumors, higher rates of recurrence, and higher rates of brain metastases.

Though we have effective treatments for HER2-positive metastatic breast cancer, inevitably the disease develops resistance and progresses. Understanding how and why metastatic breast cancer develops resistance is difficult, but is critical to the development of better treatments for women with this disease.

Evidence increasingly suggests that tumors evolve genomically over time and in the face of ongoing systemic therapies. A major obstacle to understanding treatment resistance is access to metastatic tumor tissue, as patients with metastatic breast cancer do not typically undergo multiple, sequential biopsies. Both tumor and normal cells shed DNA into the circulation, and even a small amount of circulating tumor DNA (ctDNA) is detectable via next-generation sequencing technologies that are able to “read” the DNA code.

As a Terri Brodeur fellow, Dr. Parsons aims to identify, via the ctDNA changes in the tumor, DNA that cause treatment resistance in patients with HER2-positive metastatic breast cancer. She hypothesizes that she will see more of these changes in the ctDNA of patients with metastatic breast cancer who have had extensive treatment than those who have not or those with early-stage breast cancer. These changes may explain why these cancers develop resistance to treatment. By knowing what these changes are, Dr. Parsons aims to enable the development of better treatments for women with HER2-positive metastatic breast cancer. She intends to use the findings to design better studies, and ultimately, treatments for women with metastatic breast cancer. This project has the potential to transform our understanding of metastatic breast cancer, and to significantly advance the use of ctDNA to better understand metastatic cancer.

Dr. Parsons is a graduate of Dartmouth College and has a Master of Public Health from Johns Hopkins Bloomberg School of Public Health. She received her medical degree from Drexel University College of Medicine, where she was inducted into the AOA Honor Medical Society. She was then an Osler Medicine resident in Internal Medicine at The Johns Hopkins Hospital. She completed a fellowship in Medical Oncology at Johns Hopkins Hospital before joining the Susan F. Smith Center for Women’s Cancers at Dana-Farber Cancer Institute. She is currently an instructor at Harvard Medical School.